

# A Cross-Sectional Study on Knowledge, Risk Perception and Behavior Related to Climate Change Among Students of University of Cyberjaya

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## ABSTRACT

**Introduction:** Climate change refers to long-term shifts in temperatures and weather patterns, primarily driven by human activities. It is crucial to introduce the importance of understanding about climate change and its impacts on both the environment and human well-being worldwide as an integral component of educational curricula within institutions. However, there is still lack of research on the knowledge, awareness and behaviour regarding climate change among students in the higher institution in Malaysia.

**Objectives:** The study focuses on assessing the relationship between knowledge, risk perception, and behaviour related to climate change among University of Cyberjaya students.

**Methodologies:** Cross-sectional study with proportionate stratified random sampling was conducted among University of Cyberjaya students using a validated questionnaire that cover sociodemographic characteristics, knowledge, risk perception, and behaviour related to climate change. The data was collected using self-administered questionnaires (Google Form) via online and via physical approach. Data then analyzed with JASP 0.17 software; chi-square was used to determine associations between knowledge and risk perception, knowledge and behaviour, and risk perception and behavior of climate change. A statistical test with a p-value of less than 0.05 considered statistically significant.

**Results:** The results indicate that climate change-related knowledge level among students at the University of Cyberjaya is mostly fair to low, with 29.6% have low knowledge and 36.1% fair knowledge. The risk perception among students is notably high, with 56.4% having a high-level of perception and 43.6% having a low-level perception towards climate change. 63.9% of the students have poor behaviour related to climate change. There is a statistically significant association between the knowledge level of climate change and the risk perception towards climate change among students at the University of Cyberjaya (p-value < 0.05). The association between risk perception and behaviour was found to be statistically significant (P < 0.001). However, the association between knowledge and behaviour towards climate change among students was not statistically significant (P = 0.054). This research provides valuable finding for the decision maker in higher institution to incorporate the understanding about climate change for the effectiveness of current educational approaches and the potential for future improvements.

**Keywords:** Climate Change, Knowledge, Risk Perception And Behavior

## ABSTRAK

**Pengenalan:** Perubahan iklim merujuk kepada perubahan jangka panjang dalam suhu dan keadaan cuaca, terutamanya dipengaruhi oleh aktiviti manusia seperti pembakaran bahan api fosil (arang batu, minyak dan gas). Ia amat penting untuk memperkenalkan pemahaman mengenai perubahan iklim dan impaknya terhadap alam sekitar dan kesejahteraan manusia di seluruh dunia adalah suatu komponen penting dalam pendidikan suatu institusi. Namun, masih terdapat kekurangan pada penelitian mengenai pengetahuan, kesedaran dan sikap terhadap perubahan iklim.

**Objektif:** Kajian ini memberi tumpuan kepada menilai hubungan antara pengetahuan, kesedaran dan sikap terhadap perubahan iklim dalam kalangan pelajar Universiti Cyberjaya.

**Metodologi:** Kajian keratan rentas dengan persampelan rawak berstrata berkadar telah dijalankan dalam kalangan pelajar Universiti Cyberjaya daripada semua jantina dan fakulti menggunakan soal selidik yang disahkan yang merangkumi ciri-ciri sosiodemografi, pengetahuan, kesedaran dan sikap yang berkaitan dengan perubahan iklim. Data dikumpul menggunakan soal selidik yang ditadbir sendiri (Borang Google) melalui dalam talian dan menemui para responden secara fizikal. Data kemudiannya dikodkan dalam Microsoft Excel, dianalisis dengan menggunakan JASP 0.17; *Chi square* digunakan untuk mengenal pasti hubungan antara pengetahuan, kesedaran dan sikap terhadap perubahan iklim. Ujian statistik dengan nilai  $p$  kurang daripada 0.05 dianggap signifikan secara statistik.

**Keputusan:** Kajian menunjukkan bahawa pengetahuan berkaitan perubahan iklim dalam kalangan pelajar di Universiti Cyberjaya menunjukkan pengetahuan rendah hingga baik iaitu 29.6% mempunyai pengetahuan yang rendah mengenai perubahan iklim dan 36% pelajar UOC mempunyai pengetahuan yang baik. Malah, hanya 9.9% mempunyai pengetahuan yang cemerlang. Selebihnya (24.4%), mempunyai pengetahuan yang sederhana. Kesedaran dalam kalangan pelajar adalah tinggi, dengan 56.4% mempunyai kesedaran tinggi dan 43.6% mempunyai kesedaran yang rendah terhadap perubahan iklim. 63.9% pelajar menunjukkan sikap buruk yang mempunyai hubungan dengan perubahan iklim. Terdapat hubungan yang signifikan secara statistik antara tahap pengetahuan tentang perubahan iklim dan kesedaran terhadap perubahan iklim dalam kalangan pelajar di Universiti Cyberjaya ( $p$ -value  $< 0.05$ ). Perkaitan antara kesedaran dan sikap didapati signifikan secara statistik ( $P < 0.001$ ). Walau bagaimanapun, perkaitan antara pengetahuan dan sikap terhadap perubahan iklim dalam kalangan pelajar adalah tidak signifikan secara statistik ( $P = 0.054$ ). Kajian ini menyediakan keputusan yang berharga kepada pihak berkuasa di tahap institusi tinggi untuk mengintegrasikan pemahaman mengenai perubahan iklim dengan keberkesanan langkah-langkah pendekatan yang telah dilakukan demi mendapatkan penambahbaikan pada masa hadapan.

**Katakunci:** Perubahan iklim, pengetahuan, kesedaran, dan sikap

## CHAPTER 1. INTRODUCTION

### 1.1 Background

According to the United Nation Organization Climate change refers to long-term shifts in temperatures and weather patterns. These shifts may be natural, such as through variations in the pool solar cycle. But since the 1800s, human activities have been the main driver of climate change, primarily due to burning fossil fuels like coal, oil and gas. Burning fossil fuels generates greenhouse gas emissions that act like a

blanket wrapped around the Earth, trapping the sun's heat and raising temperatures. The detrimental effects of climate change include heatwaves, the proliferation of infectious diseases, reduced agricultural productivity, and increased susceptibility to respiratory illnesses (Smith et al., 2014).

Climate change is a pressing issue in Malaysia as it poses a threat to the country's ecosystems and socio-economic framework. The geographical location of Malaysia exposes it to challenges linked to climate change, including sea levels, more frequent extreme weather occurrences and changes, in agricultural output. This has been a heating topic as many are still unaware of the major effects of climate change. Climate change is starting to show its effects, in Malaysia with the severe weather incidents like the floods in Johor caused by continuous heavy rainfall impacting more than 50,000 individuals (Bernama, 2023). According to the Climate Risk Country Profile for Malaysia (2021) by the World Bank Group and Asian Development Bank under the climate change projection the average temperatures, in the country could rise by 3.11 degrees Celsius by the 2090s. To add up, Malaysia has been ranked as the second worst environmental democracy among 70 countries in May 2015, according to Environmental Democracy Index (EDI). Despite the evident massive climate change happening locally and globally, a lack of understanding regarding climate change from the community remains a threat. A study by Chin et al. (2014) revealed that while there is significant awareness of climate change among students, there is still a gap between knowledge and behaviour, suggesting the need for more targeted educational interventions. Recent research has highlighted the significant role that education plays in shaping individuals' understanding and attitudes towards climate change. For instance, O'Neill and Nicholson-Cole (2009) found that increased knowledge about climate change correlates with heightened concern and a greater willingness to adopt pro-environmental behaviours. Thus, this study of on university students' knowledge, perception and behaviour towards climate change provides valuable insights into the effectiveness of current educational approaches and the potential for future improvements.

University students being the future leaders and influencers play a crucial role in combatting climate change. How they perceive and approach this global challenge can greatly impact decisions and actions taken by society. This research focuses on evaluating the level of knowledge, risk perception and behaviour related to climate change, among students enrolled at the University of Cyberjaya. By bridging the gap between knowledge and behaviour, it aims to guide educational and policy initiatives, helping future generations better tackle the challenges of climate change and strive for a sustainable future. Through this study, we aim to pinpoint areas that could benefit from initiatives to improve knowledge and encourage eco behaviours.

## **1.2 Research objectives**

### **1.2.1 General objective**

To understand the relationship between knowledge, risk perception and behaviour related to climate-change among students of UOC.

### **1.2.2 Specific objective**

1. To study climate change related knowledge among students of UOC.
2. To study the risk perception towards climate change among students of UOC.
3. To study the association between knowledge and risk perception toward climate change among students of UOC.
4. To study behaviour related to climate change among students of the UOC.

5. To analyse the association between risk perception of climate change behaviour related to climate change among students of the UOC.
6. To analyse the association between knowledge and behaviour related to climate change among students of the UOC.

## CHAPTER 2. LITERATURE REVIEW

### 2.1 Awareness and Knowledge on the Impacts of Climate Change

Understanding the impacts of climate change is essential for fostering a climate-friendly community. Employees in financial institutions, for instance, need a deep comprehension of climate change, its causes, and consequences to make informed decisions and contribute to mitigating climate impacts (Kasotia, 2007). Knowledge plays a crucial role in shaping individuals' behavior and responses to climate change (Taber & Taylor, 2009). Despite the importance of climate change awareness, many people lack a comprehensive understanding of how climate change affects society. This gap in knowledge often leads to reliance on local knowledge for making predictions and long-term assessments in the face of uncertainty (Rahman et al., 2014). For example, Rahman et al. (2014) found that only 35% of high school students in a climate-vulnerable country demonstrated a good understanding of climate change. Effective educational strategies are thus necessary to enhance public understanding of climate change and its consequences (Boyes & Stanisstreet, 2012).

Research by Asuquo and John (2007) revealed that in the Ediba Community, only 40% of respondents had an accurate understanding of climate change, underscoring the need for improved educational interventions. Similarly, Lee et al. (2023) found that while the majority of university students in Klang Valley received information about climate change, a significant portion still lacked a deep understanding of the topic.

### 2.2 Risk Perception towards Climate Change

Climate change poses a structural risk to various sectors, including the financial industry and the global economy. According to Malaysia's central bank, climate change impacts can be categorized into physical risk, transition risk, and liability risk (Bank Negara Malaysia, 2019). Physical risks arise from climate-related events that destroy infrastructure and disrupt trade. Transition risks stem from the shift to a lower-carbon economy, necessitating significant adjustments in policy, legal frameworks, technology, and markets. Both physical and transition risks contribute to liability risks.

Public understanding of climate-related risks is crucial for shaping effective adaptation and mitigation policies. Risk perception influences individuals' willingness to address climate change and participate in related activities (Lujala, Lein, & Rød, 2015). For instance, Lujala et al. (2015) found that 60% of individuals living near hazardous areas perceived higher risks and were more proactive in taking mitigation actions. Studies have shown that risk perception plays a critical role in adaptation and mitigation activities (Bord, Fisher, & O'Connor, 1999), highlighting the need for comprehensive measures of risk perception and climate change awareness.

Metag et al. (2017) identified five distinct typologies of Germans' views on climate change, with 45% expressing high concern and a willingness to take action, demonstrating the significant impact of risk perception on behavior. Effective communication and education strategies must address public risk perceptions to promote sustainable behaviors and resilience against climate change (Semenza, Ploubidis, & George, 2011).

### 2.3 Behavior Related to Climate Change

Attitudes towards climate change significantly influence public awareness and behaviour. The knowledge-behaviour gap identified by Boyes and Stanisstreet (2012) suggests that knowledge alone does not directly translate into behaviour change. Positive attitudes and active participation in climate-related activities are also critical factors. Improving students' knowledge of climate change can enhance societal awareness.

Studies have emphasized the importance of targeting educational systems to address misconceptions and foster informed behaviours (Chin et al., 2014). For example, Chin et al. (2014) found that only 30% of Malaysian university students were actively involved in climate-related activities, despite a general awareness of climate change issues.

Di Giusto et al. (2018) conducted a study among university students in Taiwan and found that 65% were aware of climate change, but only 25% engaged in proactive behaviors to mitigate its effects. Similarly, Esa et al. (2016) reported that while 70% of Malaysian university students recognized the importance of environmental activism, only 45% demonstrated a willingness to participate in such activities.

Boyes and Stanisstreet (2012) highlighted the importance of addressing the knowledge-behavior gap by fostering positive attitudes towards climate change. They argued that educational interventions should not only provide information but also encourage active engagement and positive attitudes to drive behaviour change. This approach is supported by findings from Whitmarsh (2005), who noted that in the South of England, 55% of respondents who had a high understanding of climate change also exhibited behaviours consistent with climate change mitigation efforts.

These findings underscore the need for comprehensive educational strategies that address both knowledge and attitudes to foster effective climate change mitigation and adaptation behaviours among students. By targeting educational systems and promoting active engagement, it is possible to bridge the gap between awareness and action, leading to more significant societal impacts.

### 2.4 Justification of Research

One of the most critical challenges facing the planet, climate change will leave its mark on the environment and human communities alike. Given the influence of educational institutions on the perception and behavior of future generations, it is important to explore how students perceive and respond to climate change. This study aims to investigate various dimensions of climate change awareness, perception, and behavior among students of the University of Cyberjaya.

### 2.5 Conceptual Framework

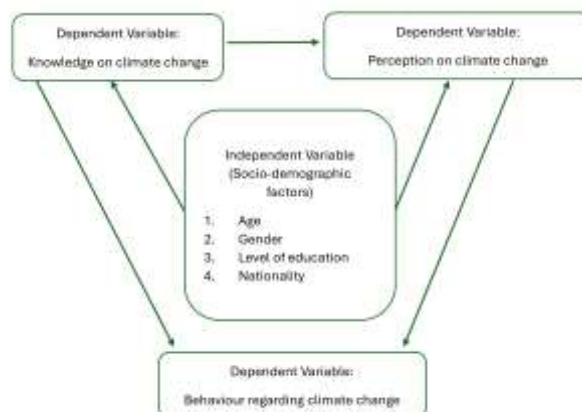


Figure 2.5.1: Conceptual Framework of Research Variables



### CHAPTER 3. METHODOLOGY

#### 3.1 Study Design

The study design used is a cross-sectional study. A cross-sectional was conducted at a single time point to determine the link between the variables. Moreover, data collection is carried out by surveys utilizing self-administered questionnaires.

#### 3.2 Sampling Method

Proportionate stratified random sampling method was used in this study in which the population of our study divided into stratas and the number of responses was limited to the number of respondents acquired from each stratum. Stratified random sampling offers the advantage over completely random sampling of ensuring all groups of interest to the researcher are adequately represented. The number of students required from each stratum is determined using the following formula:

$$\frac{\text{number of students in stratum}}{\text{number of students in study population}} \times \text{sample size}$$

Our online based questionnaires been distributed through email, whatsapp groups, telegram groups, other social media platforms and by physical approach towards the study population. The questionnaire handed out to every class representative in order to obtain respondents from all faculties. Each student of UOC from different faculties that suits the criteria had an equal chance to be selected in the sample size from the population. The data then collected and selected randomly. Thus, the result is not be biased.

#### 3.3 Sample Size

The sample size in this study was calculated using the Single Proportions formula:

$$n = \frac{Z^2 p(1-p)}{d^2}$$

$n$  = sample size

$Z$  = 95% confidence level which is 1.96

$d$  = margin of error with precision set to 5%

$p$  = 0.766 is the prevalence of university students with good knowledge towards climate change which was referenced from Lee et al., (2022).

Research Study	Prevalence
Knowledge, attitude and perception on climate change and dietary choices in a predominantly Chinese university students population in Klang Valley referenced from Lee et al., (2022)	<b>0.766</b>

Below is the sample size calculation:

$$n = \left( \frac{1.96^2 \times 0.766 \times (1 - 0.766)}{0.05^2} \right) + 0.10 \left( \frac{1.96^2 \times 0.766 \times (1 - 0.766)}{0.05^2} \right) = 289$$

After taking into consideration a 10% non-respondent the final total sample size was 289 students, but we obtained 291 respondents who filled in our survey forms.

#### Study Location

This cross-sectional study was carried out at the University Of Cyberjaya main campus, Persiaran Bestari, Cyber 11, 63000 Cyberjaya, Selangor

### 3.4 Study Duration

This study was conducted between November 2022 till May 2024 for about 19 months.

### 3.5 Study Population

The population used in the study were the students of both gender and from all faculties, studying in the University of Cyberjaya.

### 3.6 Sampling Unit

#### 3.6.1 Inclusion Criteria

- Able to speak, write and talk in English as the survey will be conducted in English.
- Able to give informed consent.
- Able to understand the questionnaire.
- Students exposed to climate change, and therefore include all age groups.

#### 3.7.2 Exclusion Criteria

- Replicated responses from multiple students.
- Unwillingness to participate in the study.
- Incomplete Responses.
- Non-Student Status.

### 3.7 Data Collection

This study is a quantitative study using self-administered English - language questionnaires as the survey method. An informed consent given to the students which describes the purpose of the study, the risks and benefits of the study, as well as the estimated time of 5-10 minutes to complete the questionnaires. Besides that, the informed consent also highlights the confidentiality as to keep all information related to the students to be kept anonymous in order to maintain confidentiality, as well as their rights to withdraw anytime during the research. After the students had gone through the informed consent, the questionnaires was disseminated to the students through an online platform by google form. Data was collected through google forms via online platforms distributed through student's email, WhatsApp and Instagram. The volunteered students was given forms to fill up the pre-tested, close-ended questionnaire to obtain variables like age, gender, ethnicity, level of current education and course of study and information regarding knowledge, risk perception and behaviour related to climate change was also gathered through the same questionnaire. After gathering all the data from the questionnaires, data analysis processes was conducted through the use of the JASP 0.17 (intel) software to determine the outcome of the research. Only researchers, including students and lecturers, could access study data which is password protected and destroyed after five years of data collection.

### 3.8 Research Tools

A structured questionnaire was filled out by respondents. The questionnaire comprised four major parts. Part one was designed to measure socio-demographic data for example age, gender, ethnicity, level of current education and course of study. Parts two, three, and four were about the students' Knowledge, Risk perception and Behaviour related to climate change. The questionnaire used for this research, which had been granted the permission to use, was adopted from Di Giusto et al., (2018) for awareness and knowledge on the impacts of climate change, Semenza et al., (2011), Rahim and Husnain (2014) and Rahman et al., (2014) for risk perception towards climate change and Whitmarsh, L. (2005) for behaviour related to climate change. Prior to the commencement of data collection, we conducted a pre-test of the questionnaire among randomly selected students of University of Cyberjaya to evaluate its' validity and reliability.

There were 4 main sections of this questionnaire;

#### **Section 1: Sociodemographic Characteristics.**

This section contains 6 items Appendix B namely age, gender, level of education, course of study, year of study and nationality.

#### **Section 2: Knowledge related to climate change.**

Knowledge was measured with fifteen multiple-choice questions covering basic scientific and social aspects of climate change. Each correct answer questions weighs 1 mark. These questions assess the students' factual and theoretical knowledge on climate change. The knowledge level is then categorised according to the scores obtained from this section.

Level 1 (Low)	: 0 % - 40 %
Level 2 (Moderate)	: 41% - 60%
Level 3 (Fair)	: 61% - 80%
Level 4 (Excellent)	: 81% - 100%

#### **Section 3: Risk perception on climate change.**

To measure the risk perception, this section contained ten questions. Students were given the response options of "Strongly agree" (5 marks), "Agree" (4 marks), "Neutral/uncertain"(3 marks), "Disagree" (2 mark) and "Strongly disagree"(1 mark). Students are considered high risk perception if the total scoring of  $>10$  while low risk perception for total score of  $\leq 10$ .

#### **Section 4: Behaviour related to climate change**

To measure readiness to make behavioural changes, this section contained 5 questions. In this questionnaire, students given the response options of "not at all"( 1 mark), "a little" (2 marks), "some"(3 marks) or "very much"(4 marks). Students are considered poor behavior if the total scoring of  $>10$  while poor behaviour for total score of  $\leq 10$ .

### 3.9 Ethical Consideration and Ethical Approval

The main ethical consideration was confidentiality and privacy. Ethical approval for this research was obtained from CRERC. The data collected was associated with the voluntary participation of the students at the University of Cyberjaya and the results obtained with their consent and their personal information was kept confidential. This study had been approved by the ethics committee of the University of Cyberjaya.



### 3.10 Statistical Analysis

As we had obtained our data, the data from the questionnaire were coded using Microsoft Excel. The statistical analysis was conducted using Jeffrey’s Amazing Statistics Program (JASP) 0.17 (intel) software.

Descriptive analysis was performed to identify the sociodemographic factors, knowledge related to climate change, perception related to climate change and also behaviour related to climate change among students. This was used to report frequency and percentage findings.

Chi-square was used to compare the association between variables of knowledge and risk perception, risk perception and behaviour and lastly knowledge and behaviour related to climate change. Chi square was opted as our statistical test of choice as it served to study on the association between 2 categorical variables. A statistical test with a p-value of less than 0.05 will be considered significant.

## CHAPTER 4. RESULTS

### 4.1 Sociodemographic Characteristics

Socio demography characteristic for this research consists of age, gender, level of education and nationality as shown in Table 4.4.1 below.

**Table 4.1.1: Sociodemographic Characteristics**

Characteristics		Frequency (n)	Percentage (%)
<b>Age</b>	< 20 years old	51	17.5
	21 to 30 years old	233	80.0
	> 30 years old	7	2.4
<b>Gender</b>	Male	129	44.3
	Female	162	55.7
<b>Level of Current Education</b>	Pre-university	114	39.2
	Undergraduate	148	50.9
	Postgraduate	29	10.0
<b>Nationality</b>	Malaysian	274	94.2
	Non-Malaysian	17	5.8
<b>Total</b>		291	100

Table 4.4.1 shows a total of 291 respondents that has participated in this study. Majority of the respondents belongs to the 21-30 age group (80%), female (55.7%), undergraduate level of current education (50.9%) and are Malaysian nationality (94.2%).

### 4.2 Knowledge on climate change among students of University of Cyberjaya

To asses knowledge on climate change, it has been categorised into 4 levels, level 1 (low), level 2 (moderate), level 3 (fair) and level 4 (excellent). Table 4.2.1 is a tabulation of prevalence of knowledge among UOC students.

**Table 4.2.1: Knowledge on climate change among students of UOC**

Knowledge Level	Frequency (n)	Percentage, %
Level 1 (Low)	86	29.6
Level 2 (Moderate)	71	24.4
Level 3 (Fair)	105	36.1

Level 4 (Excellent)	29	9.9
<b>Total</b>	291	100

Table 4.2.1 shows out of 291 students, most have a knowledge level ranging from moderate (41% - 60%) as 24.4%, fair (61% - 80%) 36.1% and only 9.9% have excellent (81% - 100%) knowledge level related to climate change. Whereas 29.6% of students have a low level (0% - 40%) of knowledge. The average score on the knowledge test was 57.8%. The highest number of students carrying 81.1% answered correctly for the question on methods of transportation that consumes more energy per person per kilometer. 2<sup>nd</sup> highest that got most students answered correctly was about the renewable energy sources that carries 75.9% followed by 73.9% on process that can reduce atmospheric CO<sub>2</sub>. For the questions on difference between climate and weather, years was the hottest temperature since from the year 1880s, factors causing the ‘greenhouse effect’, most potent greenhouse gas, correct statements regarding climate change 64.3%, 63.2%, 68.7%, 69.1%, 67.4% of them answered correctly. Again, the highest number of students answered incorrectly on the duration for the CO<sub>2</sub> to be recycled in the atmosphere and radiation that could be absorbed by the greenhouse gases in the atmosphere, change in the Earth’s mean temperature since last century and not a predicted impact from global warming with a weightage of 60.2%, 60.9% , 58.8% and 58.1% respectively. When asked questions on the activities that release the most carbon dioxide into the atmosphere, almost half of the students were right, and half was wrong. Similarly, the question on gases associated with climate change has the fastest growth rate, international treaties that hold a control over emission of greenhouse gases has almost equal amount of right and wrong answers among students.

### 4.3 The risk perception towards climate change among students of University of Cyberjaya

Table 4.3.1 is a distribution of responses based on the 10 statements provided in the questionnaire, section 3 (refer Appendix B).

**Table 4.3.1: Distribution of responses to the assessment of risk perception towards climate change among students of UOC**

Statements *	Category				
	5, n (%)	4, n (%)	3, n (%)	2, n (%)	1, n (%)
1	199 (68.4)	69 (23.7)	18 (6.1)	2 (0.7)	3 (1.0)
2	41 (14.1)	71 (24.4)	81 (27.8)	75 (25.8)	23 (7.9)
3	52 (17.9)	60 (20.6)	60 (20.6)	98 (25.8)	21 (7.2)
4	137 (47.1)	111 (38.1)	30 (10.3)	11 (33.7)	2 (0.7)
5	136 (46.7)	117 (40.2)	25 (8.6)	11 (3.8)	2 (0.7)
6	56 (19.2)	86 (29.6)	86 (29.6)	53 (18.21)	10 (3.4)
7	65 (22.3)	107 (36.8)	83 (28.5)	29 (10.0)	7 (2.5)
8	34 (11.6)	78 (26.8)	37 (12.7)	93 (40.0)	49 (16.8)
9	28 (9.6)	56 (19.2)	19 (6.5)	55 (18.9)	133 (45.7)
10	107 (35.8)	128 (44.0)	41 (14.1)	9 (3.1)	6 (2.1)

Note: \*Statements for the risk perception towards climate change attached in the appendix.

Table 4.3.1 shows that out of 291 students, 92.1% of the students strongly agree and agree for the 1<sup>st</sup> statement on to what degree do you believe that climate change is an important issue indicates that students were aware of the current climate change issue. Statements 8<sup>th</sup> and 9<sup>th</sup> on climate change is just a natural fluctuation in earth’s temperature and human activities have no significant impact on global temperatures

got 56.8% and 64.6% of the students to strongly disagree and disagree which indicates students have negative perception towards climate change by the knowledge that they acquire. Since we have 5 subcategories for our risk perception, we used the mean score (=35) of risk perception as a cutoff point to further categorize it in to 2 categorical variable which is high level risk perception that indicates high awareness towards climate change and low level risk perception which indicates low awareness towards climate change.

**Table 4.3.2: Risk perception towards climate change among students of UOC**

Risk Perception	Frequency, n	Percentage, %
High	164	56.4
Low	127	43.6
<b>Total</b>	291	100

Table 4.3.2 illustrates 56.4% have a high-risk perception towards climate change and 43.6% have a low-risk perception towards climate change.

The behaviour related to climate change among students of the University of Cyberjaya.

Table 4.4.1 is a distribution of responses based on the 5 statements provided in the questionnaire, section 4 (refer Appendix B).

**Table 4.3.3: Distribution of responses to the assessment of behavior related to climate change among the students of UOC**

Statements	Category			
	Very much, n (%)	Some, n (%)	A little, n (%)	Not at all, n (%)
Use public transport	22 (7.56)	62 (21.31)	84 (28.87)	123 (42.26)
Turn off lights when I'm not using	14 (4.81)	16 (5.50)	79 (27.15)	182 (62.54)
Buy energy efficient light bulbs	20 (6.87)	47 (16.15)	96 (32.99)	128 (43.99)
Recycle glass and other items	22 (7.56)	58 (19.93)	94 (32.30)	117 (40.21)
Take part in a campaign about an environmental issue	53 (18.21)	55 (18.90)	87 (29.90)	96 (32.99)

**Table 4.3.4: Behavior related to climate change among students of UOC**

Behaviour related to climate change	Frequency, n	Percentage (%)
Poor	186	63.92
Good	105	36.08
<b>Total</b>	291	100

Table 4.4.1 revealed that most University of Cyberjaya students do not use public transport, turn off lights when not in use, buy energy efficient light bulbs, recycle glass and other items, and take part in a campaign about an environmental issue. Table 4.4.2 shows that the majority (63.92%) of students at University of Cyberjaya have poor behavior related to climate change.

**4.4 The association between knowledge and risk perception toward climate change among students of University of Cyberjaya.**

**Table 4.4.1: Association between knowledge and risk perception toward climate change among students of UOC**

Knowledge Level	Risk Perception		Total	Chi Square (X <sup>2</sup> )	df	p-value
	High, n	Low, n				
Low	38	48	86	21.023	3	<0.001
Moderate	55	16	71			
Fair	52	53	105			
Excellent	19	10	29			
<b>Total</b>	164	127	291			

\*Chi-square test, P value <0.05 is considered significant

A chi-square test of independence was performed to examine the relation between knowledge and risk perception towards climate change. The relation between these variables was significant, X<sup>2</sup> (3, N = 291) = 21.023, p = < .001. Higher level of knowledge on climate change is more likely to have high risk perception towards climate change among students at University of Cyberjaya.

**4.5 The association between knowledge and behaviour related to climate change among students of the University of Cyberjaya.**

**Table 4.5.1: Association between knowledge and behavior towards climate change among students of UOC**

Knowledge Level	Behaviour		Total, n (%)	Chi Square (X <sup>2</sup> )	df	p-value
	Poor, n (%)	Good, n (%)				
Low	63 (73.3)	23 (26.7)	86 (100)	7.617	3	0.055
Moderate	37 (52.1)	34 (47.9)	71 (100)			
Fair	68 (64.8)	37 (35.2)	105 (100)			
Excellent	18 (62.1)	11 (37.9)	29 (100)			
<b>Total</b>	186 (63.9)	105 (36.1)	291 (100)			

\*Chi-square test, P value <0.05 is considered significant

Table 4.6.1 shows knowledge was not associated with behavior. A chi-square test of independence was performed to examine the relation between knowledge level and behavior towards climate change. The relation between these variables was not significant, X<sup>2</sup> (3, N = 291) = 7.617, p = .055. Our outcome is that knowledge on climate change does not affect the behavior related to climate change among students in UOC.

**4.6 The association between risk perception of climate change behaviour related to climate change among students of the University of Cyberjaya.**

**Table 4.6.1: Association between risk perception of climate change and behavior related to climate change among students of UOC**

Risk Perception	Behavior		Total, n (%)	Chi Square (X <sup>2</sup> )	df	p-value
	Poor, n (%)	Good, n (%)				
High	84 (51.3)	80 (48.7)	164 (100)	26.272	1	<0.001
Low	102 (80.3)	25 (19.7)	127 (100)			
Total	186 (63.9)	105 (36.1)	291 (100)			

\*Chi-square test, P value <0.05 is considered significant

Table 4.7.1 shows risk perception level was associated with behavior level. A chi-square test of independence was performed to examine the relation between risk perception level and behavior level towards climate change. The relation between these variables was significant,  $X^2(1, N = 291) = 26.272$ ,  $p < .001$ . High risk perception towards climate change is more likely than low risk perception towards climate change to have good behavior related to climate change among students of University of Cyberjaya.

**DISCUSSION**

**4.7 Knowledge on climate change among students of the University of Cyberjaya**

The results indicate that climate change-related knowledge level among students at the University of Cyberjaya is mostly fair to low, with 29.6% have low knowledge (0-40%) and 36.1% fair knowledge (61-80%). Only 9.9% show excellent knowledge (81-100%), while 24.4% demonstrating moderate knowledge (41-60%). Comparatively, Lee et al. (2022) reported that the majority of university students in Klang Valley possess a good knowledge on climate change (76.6%). In addition, Smith et al. (2018) found that 40% of University of Melbourne students had fair knowledge, aligning closely with our findings. Similarly, Lee and Wong (2019) reported that 35% of students at the National University of Singapore had moderate knowledge, indicating that moderate to fair knowledge levels are common among university students. This finding also aligns with Elsharkawy et al. (2023) which showed an approximation of 57.8% of the students of Al-Azhar university for girls in Cairo possessed a good knowledge level regarding the causes and impacts of climate change. In contrast, Martínez et al. (2020) found that 50% of students at the University of Barcelona demonstrated excellent knowledge, suggesting higher awareness levels, possibly due to different educational emphases.

However, our evaluation of climate change knowledge among University of Cyberjaya (UOC) students encountered several limitations. The questionnaire designed for this section primarily concentrated on theoretical and scientific aspects of climate change. Consequently, this focus may have introduced a bias, favoring students enrolled in science-related courses.

Nonetheless, the University of Cyberjaya can use these insights to understand how their students' climate change knowledge compares globally and to identify areas needing improvement. Strategies to boost moderate and excellent knowledge levels, such as enhanced curriculum content, awareness programs, and practical engagement could be beneficial the improvement of the current syllabus.



#### **4.8 Risk perception towards climate change among students of University of Cyberjaya**

The risk perception towards climate change among students at the University of Cyberjaya (UoC) is notably high, with 56.4% of students exhibiting a high perception, indicating a high awareness of the risks associated with climate change. Conversely, 43.6% of students have a positive perception, suggesting they perceive the risks as lower or are less concerned about the potential impacts of climate change.

This finding aligns closely with studies conducted in other parts of the world. For instance, Johnson et al. (2017) found that 60% of students at the University of California had a high-risk perception of climate change. Similarly, Nguyen and Tran (2019) reported that 55% of students at Ho Chi Minh City University demonstrated a high level of risk perception. These similarities suggest a consistent pattern of high awareness among university students in different regions, possibly due to increased global exposure to climate change information through education, media, and personal experiences.

However, contrast with the findings of Brown and Davis (2021) at the University of Texas, where only 30% of students had a high-risk perception, highlights significant variability in risk perception based on regional or cultural factors. This disparity could be attributed to differences in climate education, local climate impacts, political attitudes towards climate change, and cultural values regarding environmental issues. For example, regions that experience more immediate and severe impacts of climate change, such as frequent hurricanes or droughts, may have higher levels of risk perception. Additionally, the integration of climate change topics into the educational curriculum and the influence of local media can play crucial roles in shaping students' perceptions.

The variability observed across different studies underscores the importance of considering regional and cultural contexts when assessing and addressing climate change awareness. It also suggests that while there is a general trend of high-risk perception among university students, targeted interventions may be necessary to elevate awareness in regions where perception levels are lower. Understanding these regional differences can help in designing more effective educational programs and policies to enhance climate change awareness and preparedness among young people globally.

In summary, the high risk perception among UoC students reflects a significant awareness of climate change risks, consistent with findings from other universities in diverse geographical locations. However, the presence of 43.6% of students with a positive perception indicates that a substantial portion of the student body perceives the risks as lower or is less concerned about the impacts of climate change. The differences observed in the University of Texas study point to the need for a nuanced approach to climate change education that takes into account regional and cultural factors.

#### **4.9 Behavior related to climate change among students of the University of Cyberjaya**

As per our results, majority of UOC students have poor behaviour towards climate change as compared with their good level of knowledge related to climate change. This was expected by our team, as it aligned with the findings by Di Giusto et al., (2018) conducted among Taiwanese students. However, in our study, students' high risk perception leads to good behaviour towards climate change. In contrast, Siti Nor Bayaah et al., (2010) demonstrated the fact that respondents who had a relatively low degree of complex environmental knowledge, which may have discouraged them from being actively involved in environmental activities as these findings support their hypothesis, which states that respondents' perceptions of pro-environmental behaviour increase with increasing environmental knowledge.

Besides that, Braun et al., (2018), based on their study conducted among students from primary and secondary schools reported that the factor habitation greatly influenced the baseline behaviour where those

who claimed to live in rural areas to engage in a great deal more of the basic behaviours as compared to individuals from urban origins. Despite our focus on adults, Heejin Han and Sang W.A (2020) have chosen a narrative analysis approach to study the global youth climate movements which stated Greta Thunberg as young climate activist had used the scientific information released by IPCC during her speech in French National Assembly on July 2019. This implies the behaviour towards climate change among youngsters has been highly influenced by easily accessible scientific data on the subject. Therefore, knowledge related to climate change and global action is crucial based on the phenomenon of pro-environmental behavior which requires further investigation from the fields of psychology, sociology, and economics.

#### **4.10 Association between knowledge and risk perception toward climate change among students of University of Cyberjaya.**

Our study reveals a statistically significant association between the knowledge level of climate change and the risk perception towards climate change among students at the University of Cyberjaya (p-value < 0.05). This indicates that students with higher levels of climate change knowledge tend to have a higher risk perception, meaning they are more aware of and concerned about the risks associated with climate change.

This finding aligns with the results of a study by Kim et al. (2021) titled "Climate Change Knowledge and Perception Among University Students" conducted in South Korea, which also identified a significant correlation between climate change knowledge and risk perception. The South Korean study highlighted that students who had more comprehensive knowledge about climate change were more likely to perceive it as a significant threat. This suggests that education and awareness campaigns that effectively convey information about climate change can enhance students' understanding and, consequently, their perception of its risks.

Conversely, a study by Miller et al. (2022) titled "Understanding Climate Change Perceptions Among College Students" in the United States did not find a significant association between knowledge and risk perception. This discrepancy suggests that the relationship between knowledge and risk perception might be influenced by cultural or regional factors. In some contexts, other variables such as political beliefs, personal values, or exposure to climate-related impacts might play a more dominant role in shaping risk perception rather than knowledge alone. For instance, in regions where climate change is a politically polarizing issue, students' risk perceptions might be more influenced by their political affiliations than by their factual understanding of climate science.

Diverse findings across different studies underscores the complexity of the relationship between knowledge and risk perception. It suggests that while increasing knowledge is generally a critical component of raising awareness and concern about climate change, it may not always be sufficient on its own. Educational strategies must also consider the cultural, social, and political context in which they are implemented to be effective.

Our study's results emphasize the importance of integrating comprehensive climate change education into the curriculum at universities. By doing so, students can develop a more nuanced understanding of the issue, which is likely to enhance their perception of the associated risks. Additionally, this finding supports the need for tailored communication strategies that address specific cultural and regional contexts to effectively translate knowledge into heightened risk perception and proactive behavior.

In conclusion, the significant association found between knowledge and risk perception at the University of Cyberjaya highlights the critical role of education in shaping students' views on climate change.

Therefore, this finding should be utilized to explore methods for increasing students' knowledge about climate change, with the aim of also enhancing their proactive behavior towards it.

#### **4.11 Association between knowledge and behavior related to climate change among students in University of Cyberjaya**

Our study finds that there is no significant association between knowledge and behavior related to climate change among students in University of Cyberjaya,  $X^2(3, N = 291) = 7.617, p = .055$ . This means that the students at University of Cyberjaya have the knowledge but do not practice it in their daily lives. This result contradicts Frick et al. (2004) in "Environmental Knowledge and Conservation Behavior: Exploring Prevalence and Correlates" conducted in Germany, which reported that greater knowledge correlates with more environmentally friendly behavior.

However, Geiger et al. (2019) finds that despite the high level of general and environmental knowledge, pro-environmental behavior was merely average in their sample. The study suggested that the influence of knowledge towards behaviour is partially overridden by potential intervening factors. These factors include personal attitudes and beliefs, social norms and peer influence and lack of immediate incentives. A study by Neo Sau Mei et al. (2016) suggested that the intervening factor of convenience plays a role in practicing positive environmental behaviour in Malaysia. For example, due to the Pe'er et al. (2007) stated that while knowledge is important, emotions and attitudes are needed to turn that knowledge into action. Similarly, Geiger et al. (2019) noted that two extensive meta-analyses showed that knowledge influences pro-environmental behavior indirectly. This influence is mediated through moral norms, feelings of guilt, and the intention to act in an environmentally friendly way. It's very likely that most students at the University of Cyberjaya exhibit poor environmental behavior despite having a high level of knowledge, due to a lack of interest, lack emotional connection to environmental issues and inadequate influence from surroundings.

#### **4.12 Association between risk perception and behavior toward climate change among students of UoC.**

There is a significant association between risk perception of climate change and behavior related to climate change among students of University of Cyberjaya,  $X^2(1, N = 291) = 26.272, p < .001$ . Our findings are consistent with the results of Lorraine Whitmarsh et. al (2011) which found a significant correlation between the perception of climate change risks and the likelihood of engaging in pro-environmental behaviors. Individuals who perceived higher risks were more likely to report behaviors aimed at mitigating climate change, such as reducing energy use and supporting environmental policies. Brody, S. D., Grover, H., & Vedlitz, A. (2012) found a significant relationship between individuals' perceptions of the risks posed by climate change and their willingness to engage in behaviors to mitigate those risks. The researchers highlighted that higher perceived risk was associated with increased willingness to support environmental policies and adopt personal actions to reduce carbon footprints. Semenza, J. C., Ploubidis, G. B., & George, L. A. (2011) the research demonstrated a significant correlation between climate change risk awareness and proactive behaviors among urban residents. Individuals who perceived greater risks from climate change were more likely to engage in adaptive behaviors such as supporting climate policies, reducing energy use, and preparing for extreme weather events. In a study by Van der Linden, S. (2015) proposed a comprehensive model incorporating cognitive, affective, and social factors to explain climate change risk perceptions and their influence on behavior. The findings indicated that higher risk

perceptions, influenced by knowledge, affect, and social norms, were significantly associated with increased engagement in climate-friendly behaviors. Bord, R. J., O'Connor, R. E., & Fisher, A. (2000) this research found that public risk perceptions of global climate change were significantly related to their support for government policies aimed at reducing greenhouse gas emissions and their willingness to take action. Higher perceived risks were strongly associated with proactive climate-related behaviors. Smith, N., & Leiserowitz, A. (2012) This study explored how affective image associations with global warming influenced risk perceptions and behavior. It is found that individuals who perceived higher risks were more likely to engage in behaviors such as energy conservation, recycling, and supporting climate policies. It is crucial for institutions to focus on enhancing students' risk perception of climate change, as this will greatly improve their pro-environmental behavior. Promoting positive behaviors in climate protection is essential for slowing down ongoing changes like global warming.

## **CHAPTER 5. LIMITATION, CONCLUSION, AND RECOMMENDATION**

### **5.1 Limitation**

One limitation of this research is the sample size, which may not be large enough to represent the entire student population at the University of Cyberjaya, thus affecting the generalizability of the findings to other universities or regions. Additionally, the study relies on self-reported data, which can be subject to biases such as social desirability bias, where respondents might overstate their knowledge or concern about climate change to align with perceived social norms. The cross-sectional design of the research captures data at a single point in time, limiting the ability to assess changes over time or determine causal relationships between variables.

The scope of the knowledge assessment might be limited, focusing on general knowledge without delving into specific areas such as the scientific basis, mitigation strategies, or policy implications, which could result in an incomplete picture of students' overall understanding. Since the study focuses exclusively on university students, it may not reflect the broader population's perceptions and behaviours regarding climate change, thus limiting the applicability of the findings to the academic context.

There is also the potential for response bias, where only students who are already interested in or aware of climate change chose to participate, potentially skewing the results towards a higher level of knowledge and concern. Furthermore, the cultural and regional specificity of conducting the study at the University of Cyberjaya may limit the applicability of the results to other contexts, as findings might be influenced by specific cultural and regional factors unique to Malaysia.

Another limitation is in the measurement of pro-environmental behaviours, which relies on self-reported surveys that may not accurately capture actual behaviours. More reliable data could be obtained through observational or longitudinal studies. The study primarily uses quantitative methods, potentially missing out on deeper qualitative insights into the reasons behind students' knowledge levels and perceptions. Including interviews or focus groups could provide a richer understanding.

Finally, the study does not account for external factors such as media influence, peer pressure, or educational programs that might affect students' knowledge and perceptions of climate change, potentially confounding the results. By acknowledging these limitations, future research can be better designed to address these issues and provide more comprehensive insights into climate change knowledge, perceptions, and behaviours among students.

## 5.2 Recommendations

To gain more detailed insights and comparisons, future studies could focus on specific student groups, such as those enrolled in non-health science-related courses, to better understand their climate change awareness and perceptions compared to their health science counterparts. Conducting longitudinal studies would be beneficial to track changes in climate change knowledge, risk perception, and behaviors over time among university students. Additionally, implementing and evaluating the effectiveness of educational interventions designed to enhance climate change knowledge could help assess their impact on students' risk perception and pro-environmental behaviors.

Expanding research to include a wider range of universities across different cultural and regional settings could identify factors influencing variations in climate change awareness and behaviors. Investigating specific factors that influence pro-environmental behaviors, such as social norms, environmental attitudes, and personal values, would provide insight into why knowledge and risk perception do not always translate to action. Assessing the impact of integrating climate change education into the university curriculum across different disciplines could reveal how formal education affects student knowledge and behavior.

The role of technology and media in shaping students' perceptions and knowledge of climate change is another important area for future research, as these tools could be used effectively in educational strategies. Evaluating the effectiveness of campus-wide sustainability initiatives and policies on improving students' climate-related behaviors and perceptions would also be valuable. Exploring the mental health aspects of climate change awareness and risk perception and understanding how high levels of concern might affect students' well-being and academic performance, could provide a more holistic understanding of the issue. Lastly, investigating the role of peer influence and student organizations in promoting climate awareness and pro-environmental behaviors among university students could uncover additional avenues for encouraging positive change. These recommendations aim to provide a comprehensive approach to understanding and improving climate change awareness, perception, and behaviors among university students.

## 5.3 Conclusion

In our completed study at the University of Cyberjaya, we found statistically significant associations between climate change knowledge and risk perception, leading to the rejection of the null hypothesis. Most students had moderate to fair knowledge, high risk perception, and low behavior levels related to climate change. High knowledge resulted in a lower risk perception, yet this did not translate into good behavior. Despite their awareness, students at UOC do not consistently practice good climate-related behaviors. These results are broadly applicable to all students at UOC, where the majority are enrolled in health science courses. Future studies could focus on comparing health science students to those in other disciplines to better understand their climate change awareness and behaviors. In light of the completion of this study, it had not only benefit UOC by enhancing its educational offerings and research profile but also contributes to broader societal goals of environmental sustainability and resilience. Through targeted interventions and collaborative efforts, UOC can play a vital role in shaping a more sustainable and resilient future for all.

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