ASSESSMENT OF RISK PERCEPTION ON MICROPLASTICS POLLUTION IN DRINKING WATER SOURCES

by

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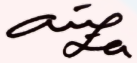
THESIS DECLARATION

I declare that the work in this report is the result of my research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in the candidature of any other degree.



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I certify that the report of this final year project entitled Assessment of Risk Perception On Microplastics Pollution in Drinking Water Sources by Noor Aiza Izzati Binti Mahmod, matric number E17A0091 has been examined and all correction recommended by examiners have been done for the degree of Bachelor of Applied Science (Sustainable Science) with Honours Faculty of Earth Science, Universiti Malaysia Kelantan.

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Assessment of Risk Perception On Microplastics Pollution in Drinking Water Sources

ABSTRACT

Degradation of plastic debris into the size of fewer than 5 millimeters in the marine environment has become a global issue. Plastics debris such as polystyrene, plastic straw, and plastics bags are significant contributors to this microplastics issue. The microplastics particles can accumulate in the freshwater system, becoming the source of drinking water. Microplastics particles in drinking water sources will pose a threat to human health and the environment. However, they are a lot of people who are not aware of these risky situations. Therefore, a survey has been conducted on Universiti Malaysia Kelantan students from all campuses towards the risk perception of microplastics pollution in drinking water sources to increase awareness regarding this microplastic pollution. On top of that, this study aims to measure the level of risk perception and the relationship between risk perception, concern and behavioural intentions of the respondents towards microplastics pollution in drinking water sources. In this study, questionnaires are distributed on an online platform to conduct the survey. About 320 respondents from Universiti Malaysia Kelantan were involved in this survey. Analysis of independent t-test, ANOVA, correlation and multiple linear regression has been used to analyse the data. Approximately 93.13% of respondents agreed with the risk perception section statement, where they were aware of microplastics' presence in their surroundings. There were 96.25% of the respondents concerned about microplastics pollution and 94.06% of respondents have high behavioural intentions to reduce microplastic pollution in drinking water sources. The results show a positive correlation between each variable. However, multiple linear regression analysis shows that the behavioural intentions do not significantly affect the level of respondents' risk perceptions.

Penilaian Persepsi Berisiko Terhadap Pencemaran Mikroplastik di dalam Sumber Air Minuman

ABSTRAK

Kemerosotan serpihan plastik dengan ukuran kurang dari 5 milimeter di persekitaran laut telah menjadi isu global. Serpihan plastik seperti polistirena, jerami plastik, dan beg plastik merupakan penyumbang penting kepada masalah mikroplastik ini. Zarah mikroplastik dapat terkumpul dalam sistem air tawar, menjadi sumber air minuman. Zarah mikroplastik dalam sumber air minuman akan menimbulkan ancaman kepada kesihatan manusia dan alam sekitar. Walau bagaimanapun, banyak orang yang tidak menyedari situasi berisiko ini. Oleh itu, tinjauan telah dilakukan terhadap pelajar Universiti Malaysia Kelantan dari semua kampus terhadap persepsi risiko pencemaran mikroplastik dalam sumber air minuman untuk meningkatkan kesedaran mengenai pencemaran mikroplastik ini. Di samping itu, kajian ini bertujuan untuk mengukur tahap persepsi risiko dan hubungan antara persepsi risiko, keprihatinan dan niat tingkah laku responden terhadap pencemaran mikroplastik dalam sumber air minuman. Dalam kajian ini, soal selidik diedarkan di platform atas talian untuk menjalankan tinjauan. Kira-kira 320 responden daripada Universiti Malaysia Kelantan terlibat dalam tinjauan ini. Analisis ujian-t bebas, ANOVA, korelasi dan regresi linear berganda telah digunakan untuk menganalisis data. Kira-kira 93.13% responden bersetuju dengan pernyataan bahagian persepsi risiko, di mana mereka menyedari kehadiran mikroplastik di persekitaran mereka. Terdapat 96.25% responden prihatin terhadap pencemaran mikroplastik dan 94.06% responden mempunyai niat tingkah laku yang tinggi untuk mengurangkan pencemaran mikroplastik di sumber air minuman. Hasilnya menunjukkan korelasi positif antara setiap pemboleh ubah. Walau bagaimanapun, analisis regresi linear berganda menunjukkan bahawa niat tingkah laku tidak mempengaruhi tahap persepsi risiko responden secara signifikan.

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
BPRM	Basic Risk Perception Model
CS	Citizen Science
FAE	Faculty of Architecture and Ekistics
FBKT	Faculty of Bioengineering and Technology
FHPK	Faculty of Hospitality, Tourism and Wellness
FIAT	Faculty of Agro-Based Technology
FKP	Faculty of Entrepreneurship and Business
FPV	Faculty of Veterinary Medicine
FSB	Faculty of Earth Science,
FTKW	Faculty of Creative Technology and Heritage
g/cm3	Gram per Cubic Centimetre
MLR	Multiple Linear Regression
mm	Millimetre
PE	Polyethylene
PET	Polyethylene Terephthalate
PP	Polypropene
PS	Polystrene
PVC	Polyvinyl Chloride
UMK	Universiti Malaysia Kelantan

LIST OF SYMBOLS

<	Less Than
%	Percentage
=	Equal
±	Plus - Minus Sign
≥	Greater-Than or Equal To
E	Margin error
F	Ratio of two mean squares
M	Mean
N	Frequency
N	Population
n	Sample size
p	Sample proportion
r	Correlation coefficient
R^2	Coefficient determination
SD	Standard deviation
Z	Confidence level

CHAPTER 1

INTRODUCTION

1.1 Background of Study

The word plastics are frequently used to describe low-density, durable, and flexible synthetic or semi-synthetic materials such as polypropylene, polystyrene, polyethylene, polyester acrylic that are regularly used for various purposes (Li et al., 2018). Plastics have been found worldwide in the freshwater environment, with estimates showing more than 5 trillion plastic debris floating at a set. A significant amount of this plastic waste originates from coastal sources that mainly enter the water environment through rivers, industrial and urban effluents, and beach sediment runoff. Other than that, the product of direct inputs, such as offshore industrial operations, loss of fishing nets and litter, are released due to maritime activities, including tourism, which contributed to plastic pollution. The increasing of plastic debris and microplastics becomes a particular concern for animals and human health. Because of their small sizes, a lack of sufficient technologies can be used to measure the existence of the smallest microplastics in the ecosystem and their potential to cause adverse effects on marine biota and humans (Barboza et al., 2018).

Microplastics refers to a particle with a size of < 5 mm and consists of two forms, which are primary and secondary microplastics. The primary source came from

the manufactured products produced in microscopic structure, while the secondary source was created after larger plastics had broken down from the larger plastic debris. Microplastic production in our natural ecosystems relies on the biological or chemical cycle on the materials' density, form, and degradation phase (Khalik et al., 2018).

Besides, increasing the microplastics problems highlights the influential environmental factors, such as ecological behaviour, awareness, and knowledge. It is hypothesized that if people become more knowledgeable about the environment and its related issues, they will become more aware and be more motivated to act towards it in responsible ways (Aminrad et al., 2013). Thus, for this reason, the responsibility for behavioural change to reduce the issues lies within themselves. Studies have shown that plastic recycling has been taken more seriously in Europe and has become more relevant to the individual when people realize that plastic pollution plastic has increased.

Risk perception is an individual's judgment about the possibility of harmful incidents such as injury, illness, disease. This study focuses on the deteriorating effects of microplastics pollution in drinking water sources (Paek et al., 2017). It means, every action or event can affect human health and the ecosystem. Moreover, the risk perception will assess how the people see and deal with specific hazards, helpful in health and risk communication to find solutions for interventions (Floer & Gutteling, 2019).

Therefore, this study focused on the dimensions of risk perceptions which were cognitive dimension and perceptive dimension. The cognitive size relates to an individual's knowledge and understanding of the risk itself, including the personal need to acquire more information regarding the microplastic issues and magnitude of

which its existence is denied based on knowledge (Janmaimool & Watanabe, 2014). The cognitive dimension consists of the perceived ability to control the risk, the person's concerns about the social surrounding, previous experiences facing, and the perceived benefits of industrial development (Floer & Gutteling, 2019). In this study, concern and behavioural intentions are the components of the cognitive dimensions.

As for the conceptual framework in this study, risk perception is the dependent variable, while concern and behavioural intentions are the independent variables that will affect the respondents' risk perceptions towards the microplastic pollution in drinking water sources. Therefore, the collected data determined whether concern and behavioural intentions affected the respondents' risk perceptions.

Conceptual Framework

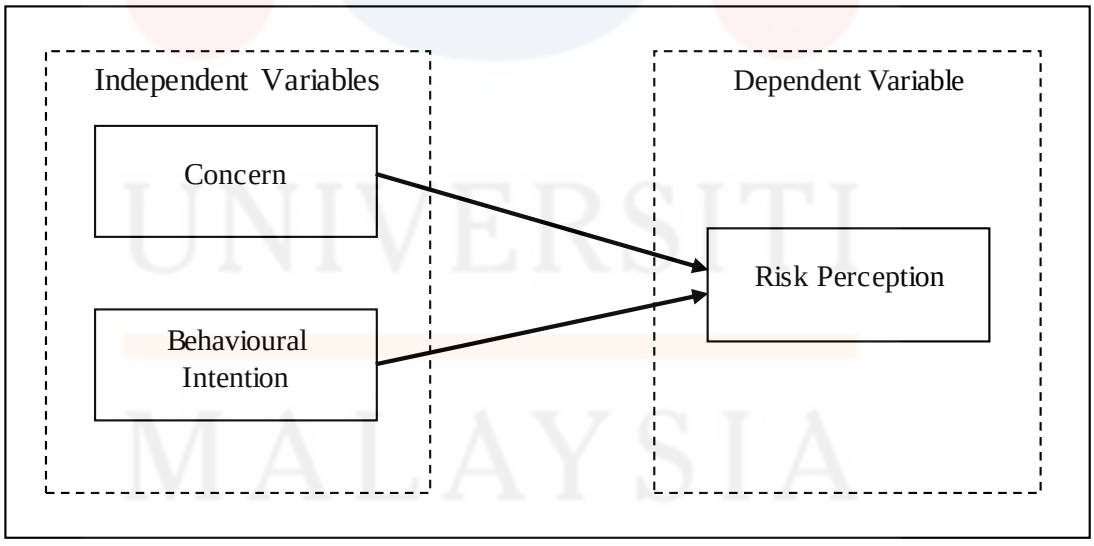

Figure 1.1: The conceptual framework.

1.2 Problem Statement

In the last 70 years, plastic production has grown worldwide until today, where it has spread to the soil's environments, sediments, surface layers, freshwater, and drinking water. Humans nowadays have lived in a world of plastics (Campanale et al., 2020). This is because the Malaysian Ringgit's production of plastic-based materials in 2010 was worth 15.8 billion. It is worth noting that plastic is the highest contributor to solid waste composition in Malaysia (24%) or even the top producer in Asian countries (Khalik et al., 2018). Unfortunately, these plastic productions have become a severe environmental threat, which was plastic pollution. In 2010 alone, approximately 4.8–12.7 million metric tons of plastic waste that were not taken care of have reached the freshwater ecosystems (Floer & Gutteling, 2019). Due to mechanical, biological and thermal degradation, these larger plastic objects, which are also called macro fragments, break up into smaller parts, which were microplastics and pollute the freshwater environments.

Microplastics pollution in freshwater ecosystems became severe as various birds, fish, and invertebrate species were found to ingest these microplastics. More than 800 species are affected due to production (Rist et al., 2018). The microplastics' occurrence has been supported in a paper written by Karbalaei et al. (2018), where the last 50 years, the plastics production had risen dramatically, from 1.7 million tons in the 1950s to 335 million tons in 2016. This global of increasing plastic production trends, consumer-use patterns, inappropriate plastic waste disposal and demographics will be hard to decrease in the nearest time if plastic usage is growing until today. Based on the increasing number of plastic productions, it can be said that human behaviour is the main factor in the rising amount of microplastics pollution. For example, the human will design and their products from plastics, and dispose of it

when not used. As a result, this action contributes to plastic waste disposal into the freshwater ecosystems, hence pose threats to aquatic animals.

Although the human microplastics' impacts are seen and felt, there was a lack of public awareness regarding these issues. Microplastics issues are less discussed with the public, making them less aware and concerned about these matters. Less understanding of the microplastics issues and their impacts on human health and aquatic life shows that the people have a low level of risk perception within themselves, and the environment's quality could not be achieved. Besides, most studies focused on the microplastics' presence in freshwater ecosystems, soils and sediments. But less research on human behaviour and perception towards microplastics pollution. It can be proven that in previous studies in Dungun, Terengganu (Yang et al., 2020), the researchers concluded that anthropogenic activities such as fishing activities by humans contribute to microplastics pollution in drinking water sources. This shows that people are having behavioural problems regarding these microplastics issues and need to be changed.

Therefore, throughout this study, the risk perception of the students in Universiti Malaysia Kelantan on the microplastics pollution in drinking water sources was identified. From this study, the level of risk perception, concern and behavioural intentions of the respondents were identified. Besides, the relationship between risk perception, concern, and behavioural intentions was analysed and the most significant independent variable that influences the respondents' risk perceptions were identified.

1.3 Objectives

The objective of the study as following:

- To assess respondents' level of risk perception towards microplastics pollution of drinking water sources.
- To assess the relationship between the respondents' risk perception, concern, and behavioural intentions towards the microplastics pollution in drinking water sources.

1.4 Scope of the Study

This study had assessed the risk perceptions towards the microplastics pollution in drinking water sources among UMK students. The questionnaires were distributed to the Jeli campus students, Bachok and Pengkalan Chepa, using online platforms such as WhatsApp, Telegram and Instagram. The questionnaires consisted of four sections, which were demographic, risk perception, concern and behavioural intentions. Before distributed the questionnaires to the targeted respondents, a pilot study has been conducted to ensure the reliability and internal consistency of the questionnaires. Thirty-two respondents of non-UMK students, which was 10% from the sample size were involved in this pilot study. The results from the pilot study were analysed by using the Cronbach alpha before distributed to the targeted respondents. The targeted respondents in this study were the fourth year UMK students who have a population of 1891 students in total. Based on the equation by Cochran (1963), the sample size was calculated and the total sample size in this study was 320 respondents. Overall data from this survey were analysed using Statistical Package for Social

Science (SPSS) version 20.0 software. In this study, the influence of variable risk perception, concern and behavioural intentions on the respondents were determined.

Next, the relationship between the variable risk perceptions, concern and behavioural intentions was observed using Spearman's Rho test (Aminrad et al., 2013). This test explained the strength of the relationship. It was to identify a significant correlation between the risk perceptions, concern and behavioural intentions towards the microplastics pollution in drinking water sources.

1.5 Significance of Study

Studies have been shown that continuous consumption of plastics, lack of awareness and human concern contribute to microplastics pollution. Other than that, human behavioural problems will contribute to the increasing trends of microplastics pollution. Hence, it will pose adverse effects on human health and aquatic life. Therefore, to overcome this issue, the respondents' risk perception towards the microplastics pollution in drinking water sources was conducted. The respondents' behavioural intentions toward the presence of microplastics pollution have been observed. The relationship between risk perception, concern, and the respondents' behavioural purposes towards the microplastics pollution in drinking water sources was assessed.

CHAPTER 2

LITERATURE REVIEW

2.1 Microplastics

Microplastics was introduced back in 2004, where it describes the plastics in the water and sediments that have a size smaller than 5 mm (Chubarenko et al., 2016). However, nowadays, the microplastics' term is used to describe the plastics that have size ranges from a small number of microns to diameter with few millimetres (Hidalgo-Ruz et al., 2012). Koelmans et al., (2017) have stated in their studies that it is estimated that the percentage of the amount of plastic debris, especially microplastics, in the ocean has been more than 60%. This situation increases global concern because it will affect the ecosystem's quality, cause biodiversity loss, and threaten human health (Hidalgo-Ruz et al., 2012).

2.2 Types of Microplastics

Microplastics are divided into two types, which are primary and secondary microplastics. The primary microplastics are the main microplastics, made less than 5 mm in size. This type of microplastics is directly released into the environment as small plastic particles. The primary microplastics are specially produced from the textile industry, the pharmaceuticals industry and personal care products such as body

scrubs and face cleanser (Browne et al., 2010). Based on the (Boucher & Friot, 2017), 35% of the synthetic textiles were released into the oceans. These activities occur during laundry, where the abrasion and shedding of the fibres will be discharged into the wastewater, hence increase the number of microplastics. The secondary microplastics occurred when larger plastic debris was degraded through physical, chemical and biological interactions (Hidalgo-Ruz et al., 2012). The larger plastic debris such as industrial resin pellets, fishing nets and the use of plastic bags would lead to the increased production and release of secondary microplastics into the environment (Hidalgo-Ruz et al., 2012). A study conducted in Terengganu shows that abundant fibres from the fishing ropes and fishing nets are found in Sungai Dungun due to human fishing activities.

2.3 Densities of the Plastic Polymers

Different types of plastics have different densities depends on their polymer and production processes. Low buoyancy plastics are more likely to spend more time on the water surface and be brought to long distances and found on sandy beaches. The plastics' densities may change depending on the oceans' condition, such as the density of the polystyrene change from 1.41 to 1.24 g/cm^3. The types of microplastics present in the oceans depend on the sites and the methods of sampling processes. Studies stated that in deep water, 56.9% of the overall synthetic fibres found are made of rayon (viscose), a human-made non-plastic polymer and has a density of 1.5 1.52 g/cm^3. Polyester has a density of 1.2-1.5 g/cm^3, polyamides with a density of 1.02-1.05 g/cm^3, while acetate density is 1.32 g/cm^3 and acrylic with a density from 1.14-1.18 g/cm^3. At the surface of the water, the number of microplastics that have high

buoyancy is dominating. For example, polyethylene (PE) (0.89-0.97 g/cm^3), polypropylene (PP) (0.90-0.92 g/cm^3), polystyrene (PS) (1.04-1.11 g/cm^3), polyvinyl chloride (PVC) (1.16-1.58 g/cm^3) and polyethylene terephthalate (PET) (1.29-1.45 g/cm^3) (Hidalgo-Ruz et al., 2012).

2.4 Shapes of Microplastics

There are many different microplastics' shapes, such as fragments, pallets, filaments, film, foam, granules and Styrofoam, where it possibly came from various sources. The fragment's type of shape was found near the beaches and on the water's surface, and followed by pallet's forms of microplastics (Chubarenko et al., 2016). The second abundant of microplastics that mostly found in Styrofoam. Chubarenko et al. (2016) have stated that fragment shapes of microplastics depend on fragmentation undergoes by plastics. The pieces' sharp edges because of the recent introduction to the ocean environment or the degradation from the larger plastic debris. If the fragments have soft edges, the plastics might contact the older pieces they have continuously polished by the other particles (Chubarenko et al., 2016).

As for plastic films, plastics are mostly found at the beaches, the top and bottom of the water surfaces. These particles are produced from the shopping bags, constructions and package films. However, even there is an abundant amount of these plastics, there were fewer numbers or reports because they are considered fibres due to degradation into threads and filaments (Chubarenko et al., 2016).

2.5 Impacts of Microplastic Towards Environment

In the past few years, the physical effect of the plastics waste on the environment has become evident mainly in marine species, where many sea turtles, seabirds and marine mammals are affected. In recent years, many studies have illustrated the danger of microplastics to the environment, not only in the form of physical damage or ingestion that causing stomach or gut inflammation (Bordós et al., 2019). Studies have been conducted by Barboza et al. (2018) about adverse effects, showing different marine animals' results caused by exposure to microplastics such as mortality, decreased feeding levels, reduced swimming ability and reduced fertilization.

Previous studies conducted by Yan et al. (2019) stated that microplastics are quickly introduced in the freshwater environment, despite their small ingestion into the food chain. A wide variety of freshwater organisms such as zooplankton, bivalves, shrimp, fish and whales, have been documented to take in the microplastics by ingestions. The ingestion of these tiny particles can cause considerable harm to species, including lower growth rate, pathological stress, oxidative stress, and reproduction complications. Also, the toxic chemicals attached to the particles often pose a high risk to freshwater species due to the greater broad surface area and stronger microplastics adsorption ability. Harrison et al. (2018) agree that the microplastics can take up by various species from the water column. It can happen directly via ingestion or dermal absorption, most commonly through respiratory surfaces (gills). Previous freshwater zooplankton studies also included *Bosmina coregoni* and *Daphnia cucullata*. From these studies, abundant microplastics have been found by the researchers in these organisms.

2.6 Microplastics in Water

Issues related to increased plastic contamination in water affect many political, biological, social and economic studies (Chubarenko et al., 2016). Microplastics may come from various sources, such as from land and in the oceans. Ocean-based sources contribute about 20% of total plastic waste in the freshwater environment due to commercial fishing, boats and other activities, while the remaining 80% is from land sources (Li et al., 2018). Discharges from the sewage treatment plant also will increase the number of microplastics in water. A study conducted in Han River, South Korea shows that 73% of microplastics fragments and fibres were found due to the sewage treatment plant in Anyang stream (Park et al., 2020). Numerous microplastic particles and fibres can accumulate in freshwaters. However, less effort has been made to track microplastics in freshwaters than those in seawaters. Such freshwaters may be sources of microplastics (wastewater treatment plants), moving channels (rivers) and sinks (isolated lakes) (Li et al., 2018). It has already been shown that freshwater waste, beach garbage, tourism and other microplastic contamination cause ecological and aesthetic problems.

Simultaneously, microplastic particles also act as efficient reservoirs of various contaminants and chemical pollutants and can migrate up the food chain to our tables (Chubarenko et al., 2016). Meanwhile, microplastics in sewage were heavily polluted by organic content and existed as large pieces. On the other hand, they were almost free of organic material in clean freshwaters and hardly seen by naked eyes (Li et al., 2018).

2.7 Microplastics Studies in Malaysia

There are limited studies that have been carried out in Malaysia regarding microplastics (Praveena, Shaifuddin, & Akizuki, 2018). However, a study was conducted at two significant locations on Peninsular Malaysia's on the east coast, namely Kuala Nerus in Terengganu and Kuantan in Pahang. Kuala Nerus was chosen to represent the non-urban area, while Kuantan was an urban area with its port activities. Water samples were obtained as examples of various anthropogenic activities from both regions. The researchers found out that the abundance of plastic debris at both sampling areas is due to the local human activities (Khalik et al., 2018). Other than that, from the studies that have been conducted in Cherating river and Cherating mangrove, Pahang, they have found an abundance of microplastics of fragments shape in the river compared to mangrove by 0.0070 ± 0.0033 particles/m^3 and 0.0051 ± 0.0053 particles/m^3 respectively (Pariatamby et al., 2020).

In Johor, researchers have been carried out studies on microplastics in commercial fish in the Skudai river. Based on the reviews, they have found out that 40% of microplastics have been ingested in the fishes' gastrointestinal tract. The average amount of microplastics ingested were 1.08 ± 1.77 (mean ± standard deviation) items per individual. The results show that most of the microplastics shape comprised of the film (43.28%), fragment (28.36%), fibre (20.9%) and foam (2.99%) (Sarijan et al., 2019). Karbalaei et al. (2019) also have conducted a study on commercial fish in Malaysia, where 43 particles (76.8%) have been confirmed as plastic polymer, three particles (5.4%) have been identified as pigments and ten particles (17.8%) have not been identified. Fragments were the most common type of plastic (67.4%), followed by fibres (16.3%) and films (16.3%).

2.8 Definition of Risk

Irizarry & Abraham (2006) stated that there are various risk concepts, including the presence of life or health risks to the possibility of injury or loss and the probability of harm. Koelmans et al. (2017) agree that human health and the environment's actual threats continue to stay extremely vulnerable. Definition of risk refers to the possibility of experiencing damage or danger. Hazards refer to risks to people and the things they respect. In contrast, probability refers to the likelihood of a harm's or hazard's occurrence, which may appear to be viewed with a degree of uncertainty. The uncertain aspect of risk is related to people's disagreements about a given risk's magnitude and severity, where people experience difficulty when a situation is ambiguous, unpredictable, or probabilistic (Paek et al., 2017).

2.8.1 Risk Perception

Risk perception can be described as the subjective evaluation of an adverse incident that happens along with the fear of consequences (Wagner et al., 2014). Paek et al. (2017) also share the same opinion. They stated that risk perception refers to people's subjective assumptions about the probability of adverse outcomes such as injury, sickness, disease and death. Risk perception is critical in health and risk communication as it defines which hazards people care about and how they interact with them. The risk perception has two main dimensions: the logical dimension that refers to how much people think about and appreciate threats, and the emotional aspect, focusing on how they feel about them.

The term risk perception is mostly associated with Ulrich Beck's description of the “risk society” in his book. Over the last decades, scientific attention to plastic

pollution has been increased markedly. Today, Citizen Science (CS) is most commonly conducted when projects are designed to combine scientific experience and skills at research institutions with professional amateurs' work. On the other hand, this depiction provided some backlash as it created an impression of plastic islands floating in the ocean because these islands do not exist. Some critics have suggested that the environmental crisis has been exaggerated and may erode people's trust in the institutions. Since the first studies were released in the decades, plastic contamination was not viewed as a significant danger, and the polluted water is abstract. It cannot be measured because it is not readily accessible to most people. Little information was communicated to the public about the problem and as a piece of evidence, people clearly cannot perceive a risk of not being aware of it. Plastic is recognized as a significant driver of high scientific interest, increasing the international media interest and doing some of the policy initiatives (Wagner et al., 2014).

A common concept in risk perception research is that people's awareness and confidence about a risk dictate how they view it. This concept is based on the rational choice paradigm of decision making, which describes people as weighing the probability of consequences after measuring possible costs and benefits. (Paek et al., 2017). Slovic and his colleagues called attention to the heuristic effect, which refers to people's propensity to rely on their current feelings when making decisions about risks in the sense of perception of the risk. If, when we experience danger, we feel extreme fear, we are likely to consider it as more dangerous and more prevalent.

Similarly, the risk-as-feeling hypothesis suggests that emotional responses to threats are frequently independent of their cognitive evaluations and are more influential determinants of individuals' conduct (Loewenstein et al., 2001). Risk

perceptions are significant precursors to the health-related habits and other activities that experts suggest for either coping with it or avoiding the risks. (Paek et al., 2017).

Researchers have studied that four approaches need to be considered to perceive the risk. Firstly, the psychometric paradigm comprises the psychometric model and the primary risk perception model (BRPM). This psychometric model discussed how the physical properties of risks and psychological and cognitive factors significantly affect humans' perception (Janmaimool & Watanabe, 2014).

The first component of the cognitive dimensions is a concern, where it is about environmental issues such as microplastic based on an individual's values. The relative importance an individual place on themselves, others and the environment influences these values. In this case, the concern is awareness of the harmful consequences caused by microplastic pollution (Schultz, 2001). The individuals' concern is reflected in the human decision-making process (Floer & Gutteling, 2019).

Next, the cognitive dimension component is the behavioural intention. It is defined as an individual's readiness to perform a given behaviour and the only direct determinant of behaviour. The action is influenced by attitude components such as personal commitment, costs or benefits calculations, and contextual factors. A concern for the environment dictates environmentally friendly consumer behaviour. Nevertheless, the likelihood of information being restricted by the mind or the accessibility of its object can be considerably reduced by skepticism, which philosophical position holds. These contextual factors entail interpersonal influences, governmental or community perceptions and microplastics pollution (Floer & Gutteling, 2019).

The perceptive dimension focuses on how the individuals feel about the risk probability by emphasizing the individuals' feelings as seen on a moral and emotional dimension and to which extent they show disinterest regarding the topic.

Studies conducted by Janmaimool & Watanabe (2014) stated that the perceptive dimension includes the perceived probability of environmental contamination and receiving the impacts of this environmental contamination and the perceived severity of catastrophic consequences. In the study conducted by Floer & Gutteling (2019), risk perception, which has been stated before, is the component of these dimensions.

2.8.2 Public Perception Towards Microplastics

Microplastics pollution is a new subject for the public and not commonly discussed. Public perception and opinions are the key elements that encourage the public to take action and policies on conservation by adopting responsible behaviours. Public opinion and awareness of microplastics were examined based on their consumer preferences and intentions towards microplastic-free goods and the essential information for a less studied subject was developed (Elia & Giovos, 2018). Today's Citizen Science (CS) is most commonly conducted when projects are deliberately designed to combine research institutions scientists' skills and experience with professional amateurs' work, particularly within conservation biology and surveillance studies. Silvertown proposed that three factors drive the expanding use of CS. As a result, the increased use of CS can be seen as a way to be informed by citizens and necessary for the perception of risk for people to understand the focused scientific field better. As stated earlier, awareness is essential to risk perception, where citizens

perceive their risk as higher than by experts in the area. The unfamiliarity is often a key psychological driver for the perception of the risk. In such cases, because of a lack of information, people can underestimate risk.

2.9 Relationship Between Knowledge, Awareness, and Behaviours

Public awareness and perceptions of risk can be influenced by how the media cover it (Paek et al., 2017). The United States of Citizen Science (CS) is a national agency that conducted projects where they combine research institutions scientists' skills and experience with professional amateurs, particularly within conservation biology and surveillance studies. The citizen science in the field of plastic pollution has been widely used, often throughout and around an intertidal zone, for example, initiatives such as "beach cleaning." From this citizen science, the amount of knowledge available about freshwater litter can be increased (Wagner et al., 2014).

In addition to growing environmental problems, environmental issues continue to highlight ecological behaviour, understanding, knowledge and attitudes. Many researchers have previously concluded that awareness and attitude are interrelated. The Malaysian National Advisory Council on Environmental Education stated that environmental education would improve the mind-set and awareness about the environment needed to consider and address the issue to achieve sustainability. They also will help to bring about environmental awareness, knowledge, attitude and responsible behaviour. Education in the community is concerned with awareness, beliefs and action where it has an ecological obligation (Aminrad et al., 2013).

Malaysia has faced severe environmental challenges in the last decades due to rapid economic growth and industrialization. Because of environmental issues, some

researchers claimed that government policies and the public's environmental concerns played a key role in achieving sustainability. Students are unable to gain the opportunity to consider their environment due to the lack of relevant subjects on ecological education in curriculums. There is also a lack of surveys on environmental awareness, knowledge and behaviour (Aminrad et al., 2013).

CHAPTER 3

MATERIALS AND METHODS

3.1 Study Design

According to Glasow (2005), there were two steps in designing the survey. The first step was developing the sampling plan, which was used to select the population sample. The sampling plan is focusing on how to assess an appropriate sample size and the ways of the medium by which the survey was conducted. The survey platform is either performed by telephone, face-to-face interviews, mailed surveys, or online surveys. Next, the methodologies must be developed to estimate the sample population from the sample data and estimate their reliability. This process will involve determining the desired rate of responses and the survey's preferred accuracy level (Glasow, 2005).

For this study, the questionnaires were distributed to Universiti Malaysia Kelantan students from all campuses, consisting of 9042 students. However, the targeted respondents were the fourth year of UMK students, where the total population was 1891 students. The sample size in this study was calculated using the equation by Cochran (1963) and there were 320 respondents in exact from different campuses who had been involved in this study. The survey was conducted in November 2020 and the questionnaires were distributed to the targeted respondents via an online platform

through WhatsApp, Telegram and Instagram. The questionnaires were used to assess the respondents' risk perception, behavioural intentions and concern towards the pollution of microplastics in drinking water sources.

3.1.1 Respondents

According to Glasow (2005), sample selection depends on the population's size, homogeneity, sample media and cost of use, and the degree of precision needed. The students' sampling is based on their faculty and field of study (Ayalon & Yogev, 2005). This study was targeted respondents who were fourth-year students. The total population of UMK students and the total population of the fourth year students from all campuses were 9042 and 1891 (N), respectively. Hence, the sample size of the fourth year students from all three campuses were 320 with a 95% of confidence level (Z), 5% of margin error (E) and 50% of sample proportion (p). The equations to calculate the sample size (n) as stated in Eq. (3.1) – (3.2). There were 320 respondents from different faculty and campuses from the data collection managed to be involved in this study. The collected results were used to differentiate the level and relationship of risk perception, concern and behavioural intentions between the science students and non-science students from the Universiti Malaysia Kelantan. Below was the equation to calculate the sample size of 1891 respondents;

$$n = \frac{s}{1 + \frac{(s - 1)}{N}} \tag{3.1}$$

Where,

$$s = \frac{z^2 p\,(1 - p)}{E^2} \qquad (3.2)$$

3.2 Questionnaires

The questionnaires were closed-ended questions to restrict the topics' answers (Aminrad et al., 2013). The questionnaires (Appendix A) were consisted total of 4 sections to measure the variables risk perception, concern and behavioural intentions, including the demographic part. The questions which have been asked to the respondents were referred from another study. However, all the questions in this study have been modified to make it more relatable to this microplastics study and avoid plagiarism. The questionnaires' reliability test was conducted on a group of 32 non-UMK students before distributing to the targeted respondents. This data was then analysed using Cronbach's alpha with an acceptable coefficient ≥ of 0.70 in the SPSS software.

The first section of the questionnaire was section A, where the respondent's demographic information was taken into accounts, such as gender, age, race, marital status, origin state, educational level, and faculty of their studies. Section B consisted of 15 questions regarding the respondents' risk perception and was answered with 5-point Likert scales (McLeod, 2008). The values of 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree and 5 = strongly agree.

Next, section C evaluated the concern variable which also consisted of 15 questions that have 5-point Likert scale (1 = strongly not concerned, 2 = not concerned,

3 = neutral, 4 = concerned and 5 = strongly concerned). The 5-point Likert scale was used in this section when the respondent needs to choose even though they have no opinion. This section also was used to determine the level of respondents' concern regarding the microplastics pollution in drinking water sources.

The last section was section D, the respondents were assessed with the behavioural intention, where the respondents were chosen the answers on a scale from 1 until 5 (1= not at all, 2 = a little bit, 3 = somewhat, 4 = quite a bit and 5 = very much). The respondents' behavioural intentions on reducing the microplastics pollution in drinking water sources were determined from this section.

3.3 Pilot Study

Pilot studies are small-scale, preliminary studies aiming to decide whether they can understand the questions and meet the target. According to Hassan et al., (2006), every study has flaws. Hence the tools and the participants need to be reassessed. The pilot study was conducted in October 2020, a month before the real data collected from the targeted respondents. The sample size for the pilot study should be 10% of the sample size (Connelly, 2008). Therefore, the questionnaire was distributed to 32 respondents before being analysed using Cronbach Alpha.

The reliability of the questionnaires was ensured by using Cronbach's alpha analysis for all sections. The Cronbach's alpha was used to measure the inner consistency, which counted how closely connected a set of items as a group. This analysis was used as a test of efficiency in size. A 'strong' alpha value did not mean the calculation was one-dimensional. The acceptable reliability coefficient of 0.70 or higher was considered "acceptable" in most social science research situations (Taber,

2018). Therefore, questions that have an α-value lower than 0.70 should be removed. Besides, Cronbach's alpha was not a statistical measure because it was used to measure the reliability or consistency coefficient (Floer & Gutteling, 2019).

Reliability tests have been conducted before the questionnaire was distributed to the targeted respondents. Based on Table 3.1, all sections showed a high α-value, where it was more than 0.70 and proved that the questionnaire was reliable before distributed to the targeted respondents.

Table 3.1: The results from the pilot study.

Section	**Cronbach's Alpha (α)**	**Internal Consistency**
Risk perception towards microplastics pollution in drinking water sources	0.930	Excellent
Concern towards microplastics pollution in drinking water sources	0.911	Excellent
Behavioural intentions on reducing microplastics pollution in drinking water sources	0.895	Good

Note: N = 32

3.4 Statistical Analysis

The Statistical Package for Social Science (SPSS) was the software used to analyse the collected data. In this study, the type of statistical analysis involved included the t-test, Analysis of Variance (ANOVA), Spearman Rho correlation test and linear regression analysis.

3.4.1 T-Test

T-test was used when independent groups were subjected to the comparison under the assumptions of normal distribution and equal variances (Kim, 2014). The differences in the means of two mutually mutual groups independent and satisfy both the normality and similar variance assumptions can be obtained by comparing them using a t-test. There were three types of t-test, which were one-sample t-test, two-sample t-test and paired t-test (Skaik, 2015). In this study, an independent t-test has been used to compare the risk perception, concern and behavioural intentions of male respondents and female respondents. Moreover, this t-test also was used to identify the significance of the factor gender towards the level of risk perception, concern and behavioural intention of the respondents.

3.4.2 Analysis of Variance (ANOVA)

Variance analysis (ANOVA) is one of the statistical techniques used most commonly in scientific research. ANOVA was used to identify the differences in more than three groups (Kim, 2017). In this study, one-way ANOVA was used to compare the mean differences in risk perception, concern and behavioural intentions of the respondents from different campuses and faculties.

3.4.3 Spearman Rho Test

The relationship between risk perceptions, concern and behavioural intentions was observed using Spearman's Rho test (Aminrad et al., 2013). This test was about the strength of the relationship and identifying a significant correlation between the components towards the microplastics pollution in drinking water sources. The considerable level used in this study was the confidence level of $P \leq 0.05$ (Aminrad et al., 2013). The relationship between the two components was generally considered reliable when their r-value was more extensive than 0.70 (Schober et al., 2018).

The relationship between risk perception, concern, and behavioural intentions on microplastics in drinking water sources was determined successfully from the results.

3.4.4 Multiple Linear Regression Analysis

Analysis of regression is a statistical instrument for investigating the relationships between variables. A simple and widely used kind of predictive analysis is multiple linear regression. Multiple linear regression (MLR) was used to predict if the independent variable influenced the dependent variable (Humpage, 2000). Next, to decide which variable is significant to the dependent variable. From this study, the independent variable concern and behavioural intentions were used to determine whether they influenced the risk perception or not. Since that there were more than two independent variables, therefore MLR should be used instead of linear regression analysis.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Demographic Information

The parameters used for demographic data are gender, age, race, campus and faculty. The total population of the fourth-year students was 1891 students in total. From the calculated sample size using the equation by Cochran (1963), the total sample size involved in this study was 320 students from all campuses.

Table 4.1 showed respondents' distribution by campus, where there were three campuses involved: The Jeli campus, Bachok and Pengkalan Chepa campus. This study managed to get the respondents from all campuses, where 189 respondents (59%) from the Jeli campus, 66 respondents (20.7%) from the Bachok campus, and 65 respondents (20.3%) from the Pengkalan Chepa campus. The questionnaires were distributed to the students of Universiti Malaysia Kelantan through an online platform via WhatsApp, Telegram and Instagram. Most of the respondents were 21-23 years old (90%). Based on Table 4.1, the respondents were mostly Malay students, where it presented 282 respondents (88.1%) from the total number of 320 respondents in total. Most of the respondents were the FBKT students (Faculty of Bioengineering and Technology) (N = 73) however, the students from the Faculty of Veterinary Medicine

(FPV) recorded zero (N = 0) respondents in this study. This shows that the questionnaires were well distributed to all faculties and campuses except the students of FPV as the number of the respondents from this faculty was zero (N = 0).

Table 4.1: Distribution of respondents.

Factor		Faculty	N	Percentage (%)	Total (%)
Campus	Jeli	FSB	50	15.6	189 (59)
		FBKT	73	22.8	
		FIAT	66	20.6	
	Bachok	FTKW	37	11.6	66 (20.7)
		FAE	29	9.1	
	Pengkalan Chepa	FKP	34	10.6	65 (20.3)
		FHPK	31	9.7	
		FPV	0	0	
	Total		**320**	**100.0**	**320 (100)**
Age	18-20 years old		19	5.9	320 (100)
	21-23 years old		288	90.0	
	24-26 years old		12	3.8	
	27-30 years old		1	0.3	
	Total		**320**	**100.0**	**320 (100)**
Race	Malay		282	88.1	320
	Indian		14	4.4	
	Chinese		21	6.6	
	Others		3	0.9	
	Total		**320**	**100.0**	**320 (100)**

Note: FSB = Faculty of Earth Science, FBKT = Faculty of Bioengineering and Technology, FIAT = Faculty of Agro-Based Technology, FTKW = Faculty of Creative Technology and Heritage, FAE = Faculty of Architecture and Ekistics, FKP = Faculty of Entrepreneurship and Business, FHPK = Faculty of Hospitality, Tourism and Wellness, FPV = Faculty of Veterinary Medicine

In this study, referring to Figure 4.1 and Table 4.2, the factor of gender was also taken into account as it involved N = 115 (35.8%) of the male respondents, while female respondents presented N = 205 (64.1%). From the same table, the majority of the respondents came from the Jeli campus with 189 respondents (59%) consisted of 66 respondents (20.6%) were male and 123 respondents (38.5%) were female, followed by the Bachok campus with male respondents' N = 29 (9.1%) and female respondent were N = 37 (11.6%) respectively.

The male respondents from the Pengkalan Chepa campus presented the lowest involvement number of males, where they presented N = 20 (6.25%). In comparison, the female respondents from the Bachok campus showed the lowest number of female respondents, which were N = 37 (11.6%). The involvement of the male respondents from FHPK (Faculty of Hospitality, Tourism and Wellness) who contributed to this study (Table 4.2) were only eight male respondents (2.5%) in total.

Less involvement from the Bachok and Pengkalan Chepa campus may occur due to a lack of cooperation and commitment from the respondents. Besides, the respondents may feel unfamiliar with the concept of microplastics, hence failing to catch the attention of the targeted respondents. However, at the beginning of the questionnaire, a brief description of the microplastics and their characteristics was introduced to the respondents who were unfamiliar with it, so the respondents can get brief ideas regarding microplastics pollution and managed to complete the survey.

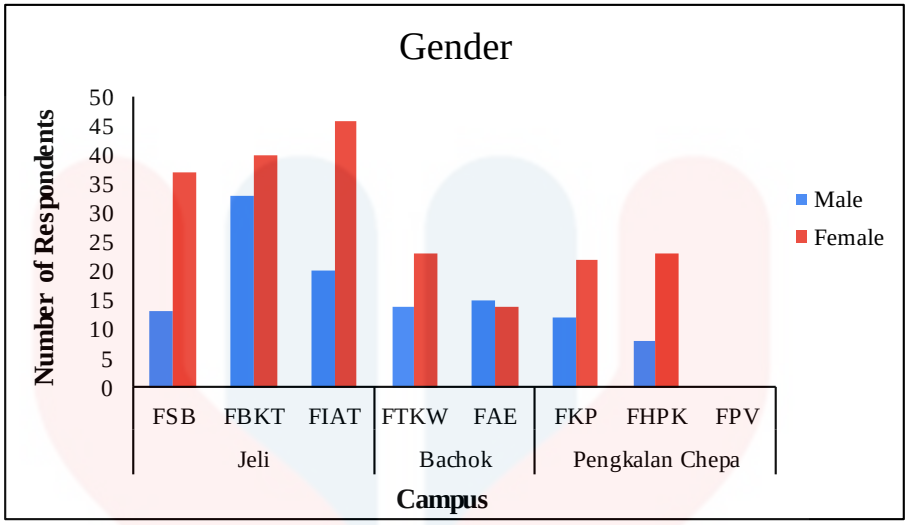

Figure 4.1: Distribution of gender by campus.

Table 4.2: Distribution of gender by campus.

Campus	Faculty	Gender		Total (%)
		Male (%)	Female (%)	
Jeli	FSB	13 (4.0)	37 (11.6)	50 (15.6)
	FBKT	33 (10.3)	40 (12.5)	73 (22.8)
	FIAT	20 (6.2)	46 (14.4)	66 (20.6)
	Total (%)	**66 (20.5)**	**123 (38.5)**	**189 (59)**
Bachok	FTKW	14 (4.4)	23 (7.2)	37 (11.6)
	FAE	15 (4.7)	14 (4.4)	29 (9.1)
	Total (%)	**29 (9.1)**	**37 (11.6)**	**66 (20.7)**
Pengkalan Chepa	FKP	12 (3.7)	22 (6.9)	34 (10.6)
	FHPK	8 (2.5)	23 (7.2)	31 (9.7)
	FPV	0 (0)	0 (0)	0 (0)
	Total (%)	**20 (6.25)**	**45 (14.1)**	**65 (20.3)**
Total (%)		**115 (35.8)**	**205 (64.2)**	**320 (100)**

Note: FSB = Faculty of Earth Science, FBKT = Faculty of Bioengineering and Technology, FIAT = Faculty of Agro-Based Technology, FTKW = Faculty of Creative Technology and Heritage, FAE = Faculty of Architecture and Ekistics, FKP = Faculty of Entrepreneurship and Business, FHPK = Faculty of Hospitality, Tourism and Wellness, FPV = Faculty of Veterinary Medicine.

4.2 Risk Perception

Table 4.3 shows that each question's frequency and percentage were analysed accordingly based on their respective scales. About 170 respondents (53.1%) strongly agreed that they know the microplastics can harm the aquatic lives and their food chain (questions No. 11). Besides, 153 respondents (47.8%) out of 320 also realize that microplastics pollution will affect the ecosystems (questions No. 8). This shows that either the respondents came from the science or non-science program, they were aware that microplastics would affect the aquatic lives and their food chains. These results were supported by a study conducted by Janoušková et al., (2020). They have concluded the basic partial knowledge of the microplastics source and formation was well acquired by students with media as the vital source of information. The respondents show their level of awareness on microplastics pollution as these issues have become world concerning. The respondents might get information regarding the microplastics pollution in drinking water sources on the Internet and social media platforms.

However, referring to Table 4.3, some respondents were not aware of these microplastics issues as 79 respondents (24.7%) were the least number of respondents who strongly agree with the statement. They strongly agree regarding the knowledge of microplastics size (question No. 14). Besides, the information on the understanding of the size of microplastics recorded the highest number of respondents that strongly disagree with the statement, which were 12 respondents (3.8%) and eight respondents (2.5%) were disagree (Table 4.3). The results show that many respondents who were not aware of the size of microplastics as the number of respondents who portrayed their opinions by chose neither agree nor disagree were 85 respondents (26.6%) in total. Most of the respondents believed in microplastics' presence in drinking water

sources and their environmental impacts. However, they were not aware of the size of the microplastics.

Table 4.3: Risk perception of the respondents' in microplastics pollution.

No.	Risk Perception of Microplastics Pollution in Drinking Water Sources	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
		N (%)	N (%)	N (%)	N (%)	N (%)
1.	I am aware that the amount of microplastics present in freshwater sources is increasing from year to year.	0 (0)	0 (0)	40 (12.5)	145 (45.3)	135 (42.2)
2.	I am aware that the degradation of plastics debris contributes to microplastic pollution.	0 (0)	0 (0)	54 (16.9)	119 (37.2)	147 (45.9)
3.	I am aware that microplastics pollution has become global issues.	0 (0)	1 (0.3)	39 (12.2)	128 (40)	152 (47.5)
4.	I am sure that microplastics pollution is an unacceptable risk.	1 (0.3)	3 (0.9)	64 (20)	139 (43.4)	113 (35.3)
5.	I am sure that single-use plastic will increase the amount of microplastics presence in freshwater sources.	0 (0)	0 (0)	54 (16.9)	126 (39.4)	140 (43.8)
6.	I am sure that synthetic clothing will release microplastics in freshwater sources.	2 (0.6)	2 (0.6)	66 (20.6)	136 (42.5)	114 (35.6)
7.	I am sure that the evidence of microplastics pollution is reliable.	0 (0)	0 (0)	61 (19.1)	146 (45.6)	113 (35.3)
8.	I am sure that microplastics pollution can affect the ecosystems.	0 (0)	0 (0)	41 (12.8)	126 (39.4)	153 (47.8)

Table 4.3: (Continued).

9.	I believe more information can form a clearer opinion about microplastics.	0 (0)	0 (0)	43 (13.4)	130 (40.6)	147 (45.9)
10.	I believe that by talking to my friends and family about microplastics will increase awareness.	0 (0)	2 (0.6)	62 (19.4)	127 (39.7)	129 (40.3)
11.	I know that microplastics can harm the aquatic lives and their food chain.	0 (0)	1 (0.3)	36 (11.3)	113 (35.3)	170 (53.1)
12.	I know that microplastics presence in various shapes.	4 (1.3)	5 (1.6)	52 (16.3)	129 (40.3)	130 (40.6)
13.	I know the microplastics pollution will affect human health.	0 (0)	0 (0)	50 (15.6)	134 (41.9)	136 (42.5)
14.	I know the size of microplastics.	12 (3.8)	8 (2.5)	85 (26.6)	136 (42.5)	79 (24.7)
15.	I know that microplastics came from various sources.	1 (0.3)	3 (0.9)	51 (15.9)	132 (41.3)	133 (41.6)

The answer of the respondents was categorized with a 5-Likert scale, which strongly disagreed (1), disagree (2), neither agree nor disagree (3), agree (4) and strongly agree (5). The respondents' score was summed and recoded into three new scales: strongly disagreed (achieved of 0 till 25), neither agree nor disagree (achieved of 26 till 50) and strongly agree (achieved of 51 till 75). Based on Table 4.4, most of the respondents have a good risk perception of microplastics pollution, where 298 respondents (93.13%) agreed with the statement in this section.

Referring to Table 4.4, 185 respondents (57.82%) from the Jeli campus agreed with the statements in this section, followed by respondents from the Pengkalan Chepa (N = 61) with a percentage of 19.06% and Bachok (N = 52) with the percentage of 16.25%. However, about nine respondents (2.81%) from the Bachok campus and two respondents (0.625%) from the Pengkalan Chepa campus scored less than 25 in this section. They were categorized as strongly disagree where the microplastics pollution will harm the environment. From the results, it shows that some of the respondents were lack of awareness regarding the microplastics pollution in drinking water sources.

The difference in the number of strongly agree between each campus was supported by a study conducted by the Czech Republic, Prague, on 384 university students. The students came from engineering, science and humanities courses and were asked five questions regarding microplastics and the results shown that 80% of the respondents answered the questions correctly. However, 80% of the respondents who answered correctly came from the science courses, but few other programs correctly answered. It means that science students have more knowledge regarding microplastics pollution compared to non-science students.

Table 4.4: Mean percentage of respondents' risk perception based on three campuses.

Campus	Frequency			Total (%)
	Disagree (%)	Neither Agree nor Disagree (%)	Agree (%)	
Jeli	2 (0.625)	2 (0.625)	185 (57.82)	189 (59.07)
Bachok	9 (2.81)	5 (1.56)	52 (16.25)	66 (20.62)
Pengkalan Chepa	0 (0)	4 (1.25)	61 (19.06)	65 (20.31)
Total (%)	**11 (3.435)**	**11 (3.435)**	**298 (93.13)**	**320 (100)**

Note: N = 320

The variations in the overall risk perceptions were examined based on factor gender and campus. An independent t-test (Table 4.5) was conducted to compare the students' risk perceptions in microplastics pollution in males and females of the UMK students. Next, a one-way Analysis of Variance (ANOVA) (Table 4.6) was conducted to compare the respondents' risk perceptions towards the microplastics pollution from each campus. The significance level for this study was set at $p = 0.05$. The results presented that only factor campus $p = 0.033$ and age $p = 0.000$ were significant (Table 4.6). However, gender $p = 0.633$ shows no significance regarding the respondents' risk perception towards the microplastics pollution in drinking water sources (Table 4.5). The female respondents indicated higher risk perception than male respondents as the mean for females was M = 4.236, N = 205 and male respondents presented the standard of M = 4.208, N = 115. It was proven, the study background and the age of the respondents play a crucial role in the perception of risk but not for gender.

Age has become one factor that may influence the respondents' risk perception towards microplastics pollution in drinking water sources as the significant value for

factor age was $p = 0.000$. Moreover, the factor campus also significantly impacted the respondents' risk perception as the significance value was $p = 0.033$, which was less than 0.05. Therefore, it can be said that the respondents were aware of the microplastics issues towards the environment as they can relate to their subjects in their program, especially the respondents from the Jeli campus.

Table 4.5: Respondents' risk perception based on gender.

Factor		N	Mean	Std. Deviation	t-test	Sig.
Gender	Male	115	4.208	0.544	-0.478	0.633
	Female	205	4.236	0.484		

Based on Table 4.6, the factor campus and age were used to identify their significance towards the respondents' risk perception regarding microplastics pollution in drinking water sources. The majority of the respondents were aged between 21-23 years old [F (2,316) = 2.938, $p = 0.000$] and the respondents from the Jeli campus have higher risk perception compared to the respondents from the Bachok and the Pengkalan Chepa campus. The highest mean risk perception was Jeli campus [F (2,316) = 4.395, $p = 0.033$] and the lowest mean was from Bachok campus, [F (2,316) = 3.849, $p = 0.033$] (Table 4.6). These results may be since the respondents from the Jeli campus have a background in science subjects compared to the Bachok and Pengkalan Chepa campus as and some of the courses in the Jeli campus were closely related to this study.

Table 4.6: ANOVA of respondents' risk perception based on campus and age.

Factor		N	Mean	Std. Deviation	F	Sig.
Campus	Jeli	189	4.395	0.442	4.598	0.033
	Bachok	66	3.849	0.477		
	Pengkalan Chepa	65	4.117	0.480		
Age	18-20 years old	19	2.790	0.419	6.909	0.000
	21-23 years old	288	2.938	0.242		
	24-26 years old	12	3.000	0.000		
	27-30 years old	1	2.000	-		

4.3 Concern

Based on Table 4.7, the frequency and the percentage of each question were analysed accordingly to their respective scales. About 152 respondents (47.5%) showed their concern about microplastics pollution, where they strongly agreed that plastics pollution would affect the freshwater ecosystem (question No. 4). From Table 4.7, two respondents (0.6%) had chosen strongly not a concern about the usage of stainless steel straw and accept the use of a plastic straw. Also, about six respondents (1.9%) chose the scale, not a concern with the statement bringing a reusable food container instead of polystyrene. A study has been conducted by Deng et al., (2020) stated that the more knowledge the respondents have about plastics pollution, the more they concern about the environmental effects due to plastics. Therefore, it can be said that some of the respondents were lack of knowledge regarding microplastics pollution. Hence they were less concerned regarding the impact of microplastics pollution on the environment.

Table 4.7: Concern of respondents on microplastics pollution in drinking water sources.

No.	Concern on Microplastics Pollution in Drinking Water Sources	Strongly Not Concerned	Not Concerned	Neither Concern Nor Not Concern	Concern	Strongly Concern
		N (%)	N (%)	N (%)	N (%)	N (%)
1.	I am concern about microplastics pollution after I knew that it comes from synthetic clothes.	0 (0)	4 (1.3)	41 (12.8)	167 (52.2)	108 (33.8)
2.	I am concern about plastic pollution when I knew lots of freshwater animals died due to pollution.	0 (0)	2 (0.6)	29 (9.1)	151 (47.2)	138 (43.1)
3.	I am concern enough that the plastic debris might harm the environment.	0 (0)	1 (0.3)	34 (10.6)	144 (45)	141 (44.1)
4.	I am concern that plastic pollution will affect the freshwater ecosystem.	0 (0)	2 (0.6)	39 (12.2)	127 (39.7)	152 (47.5)
5.	I am concern that plastics pollution will pose threats to animals.	0 (0)	0 (0)	28 (8.8)	145 (45.3)	147 (45.9)
6.	I am showing my concern about microplastics pollution by talking about it to friends and family.	0 (0)	4 (1.3)	54 (16.9)	171 (53.4)	91 (28.4)
7.	I am showing my concern about plastic pollution by spreading information on social media.	0 (0)	4 (1.3)	47 (14.7)	179 (55.9)	90 (28.1)
8.	I am showing my concern about plastic pollution by not throwing the plastic debris into the water.	0 (0)	0 (0)	30 (9.4)	146 (45.6)	144 (45)

Table 4.7: (Continued).

9.	I am showing my concern by bringing a reusable food container instead of using polystyrene.	0 (0)	6 (1.9)	43 (13.4)	164 (51.2)	107 (33.4)
10.	I am showing my concern by cleaning the beach from plastic debris.	0 (0)	4 (1.3)	53 (16.6)	160 (50)	103 (32.2)
11.	I am showing my concern by raising awareness regarding microplastic pollution.	0 (0)	4 (1.3)	40 (12.5)	182 (56.9)	94 (29.4)
12.	I am showing my concern by using stainless steel straw instead of a plastic straw.	2 (0.6)	2 (0.6)	50 (15.6)	158 (49.4)	108 (33.8)
13.	I am showing my concern by volunteering in the campaign of banning plastics usage.	0 (0)	4 (1.3)	48 (15)	172 (53.8)	96 (30)
14.	I am very concerned about microplastics pollution.	0 (0)	0 (0)	36 (11.3)	163 (50.9)	121 (37.8)
15.	I am very concerned about plastics pollution, which has been a global issue for the past few years.	0 (0)	0 (0)	34 (10.6)	173 (54.1)	113 (35.3)

Table 4.8 presented the mean percentage for the respondents' concern on microplastics pollution in drinking water sources. The respondents' answers were categorized into 5-Likert scale, which was strongly not a concern (1), not a concern (2), neither concern nor not a concern (3), concern (4) and strongly concern (5). Each respondents' score was the sum and recoded into three new scales, which were not a concern (0 till 25), neither concern nor not a concern (26 till 50) and concern (51 till 75). The mean percentage of respondents' concern about microplastics pollution in drinking water sources was 96.25% (308 respondents) and the mean percentage of for not concern was only 0.312% (1 respondent). It was proven that the respondents from all campuses could estimate the potential harm (Deng et al., 2020) and shows their concern regarding the microplastics pollution in drinking water sources.

Table 4.8: Main percentage of respondents' concern based on three campuses.

Campus	Frequency			Total (%)
	Not Concern (%)	Neither Concern nor Not Concern (%)	Concern (%)	
Jeli	0 (0)	3 (0.938)	186 (58.13)	189 (59.068)
Bachok	1 (0.312)	4 (1.25)	61 (19.06)	66 (20.622)
Pengkalan Chepa	0 (0)	4 (1.25)	61 (19.06)	65 (20.3125)
Total (%)	**1 (0.312)**	**11 (3.438)**	**308 (96.25)**	**320 (100)**

Note: N = 320

The variation of concern based on gender, campus and age were analysed. An independent t-test was conducted to analyse and compare the respondents' concern on microplastic pollution in males and females (Table 4.9). A one-way ANOVA was

conducted to compare the respondents' concern on microplastics pollution in drinking water sources for campus and age (Table 4.10). From the analysis undertaken, only campus and age were significant to the respondents' concern towards microplastics pollution in drinking water sources.

Table 4.9 shows that gender was not significant on the respondent's concern as the *p*-value was more extensive than 0.05, $p = 0.150$. Female respondents' mean was slightly higher than male respondents, where the mean for female and male respondents was M = 4.249 and M = 4.176. A study conducted by (Deng et al., 2020) proved that females respondents were more environmentally friendly and had the sense to protect the environment compared to male respondents.

Table 4.9: Respondents' concern based on gender.

Factor		N	Mean	Std. Deviation	t-test	Sig.
Gender	Male	115	4.176	0.393	-1.442	0.150
	Female	205	4.249	0.454		

Based on the results in Table 4.10, the highest mean concern were the respondents from Jeli campus [F (2,316) = 4.323, $p = 0.000$] and the lowest mean concern were from Pengakalan Chepa campus [F (2,316) = 4.067, $p = 0.000$]. The mean concern based on age was aged between 21-23 years old, with the number of respondents were 288 in total [F (2,316) = 2.976, $p = 0.000$]. The respondents were expected to be aware of these microplastics issues as they became a global issue today. Even though some of the respondents were not science students, they still showed their concern as if they heard about the microplastics issue on mass media. Studies

conducted by Jensen (2002) has stated that knowledge is crucial, as it can trigger our concern and attention by providing the starting point for a willingness to act. The studies portrayed that knowledge about microplastics pollution managed to stimulate the respondents' concern and awareness and perception of the microplastic pollution in drinking water sources. It was not strange to find that if the respondents from Bachok and Pengkalan Chepa had a sense as they already had information from a specific source such as media. This is because, it became one of the main platforms of knowledge nowadays (Janoušková et al., 2020).

Table 4.10: ANOVA of the respondents' concern based on campus and age.

Factor		N	Mean	Std. Deviation	F	Sig.
Campus	Jeli	189	4.323	0.398	13.469	0.000
	Bachok	66	4.087	0.393		
	Pengkalan Chepa	65	4.067	0.494		
Age	18-20 years old	19	2.842	0.375	14.249	0.000
	21-23 years old	288	2.976	0.154		
	24-26 years old	12	3.000	0.000		
	27-30 years old	1	2.000	-		

4.4 Behavioural Intentions

Table 4.11 shows the frequency and percentage of the respondents' answer for each scale and questions. About 170 respondents (53.1%) strongly agreed to use reusable bottles with BPA free instead of plastic bottles (question No. 13). Questions number 14 from Table 4.11 presented that 166 respondents (51.6%) were strongly agreed to use stainless steel straw instead of plastic straw when buy beverages. Next,

it was proven that most customers have high behavioural intentions in reducing microplastics pollution in drinking water as 164 respondents (51.2%) strongly agreed to minimize plastic usage to decrease the pollution (question No. 9). In contrast, two respondents strongly disagreed with question number 10, where they could not say "No" when people offered them to use the plastic cutlery and were rather to use plastic bags instead of cloth bags when shopping. Behavioural and social scientists believed that motivation is the main factor that will drive behavioural change. However, they still lack information to explain what behaviour should be taken or how to apply it (Deng et al., 2020).

Table 4.11: Respondents' behavioural intentions on microplastics pollution in drinking water sources.

No.	Behavioural intentions on Microplastics Pollution in Drinking Water Sources	Not at all	A little bit	Somewhat	Quite a bit	Very much
		N (%)	N (%)	N (%)	N (%)	N (%)
1.	I am willing to donate my money to a respected organization cleaning up the beaches and oceans.	1 (0.3)	2 (0.6)	48 (15)	146 (45.6)	123 (38.4)
2.	I want to gather more information regarding microplastic pollution.	0 (0)	2 (0.6)	43 (13.4)	131 (40.9)	144 (45)
3.	I will air dry the wet clothes instead of using the dryer.	0 (0)	4 (1.3)	40 (12.5))	118 (36.9)	158 (49.4)
4.	I will avoid using cosmetics products that contain microbeads.	1 (0.3)	3 (0.9)	48 (15)	105 (32.8)	163 (50.9)
5.	I will bring my food container instead of using polystyrene.	0 (0)	2 (0.6)	43 (13.4)	126 (39.4)	149 (46.6)
6.	I will inform family and friends about the effects of microplastics pollution.	1 (0.3)	1 (0.3)	38 (11.9)	136 (42.5)	144 (45)
7.	I will involve myself in raising awareness about plastic pollution.	1 (0.3)	2 (0.6)	34 (10.6)	121 (37.8)	162 (50.6)
8.	I will participate in the "Ban Plastics Usage' campaign.	1 (0.3)	1 (0.3)	45 (14.1)	116 (36.3)	157 (49.1)

Table 4.11: (Continued).

9.	I will reduce plastic usage to decrease pollution.	2 (0.6)	2 (0.6)	29 (9.1)	123 (38.4)	164 (51.2)
10.	I will say "NO" when people offered me to use plastic cutlery.	2 (0.6)	6 (1.9)	49 (15.3)	127 (39.7)	136 (42.5)
11.	I will share the knowledge of microplastics through social media (Facebook, Twitter, Instagram).	1 (0.3)	3 (0.9)	33 (10.3)	133 (41.6)	150 (46.9)
12.	I will use cloth bags rather than plastics bags when shopping.	2 (0.6)	4 (1.3)	36 (11.3)	120 (37.5)	158 (49.4)
13.	I will use reusable bottles that have BPA-free instead of plastic bottles.	0 (0)	1 (0.3)	31 (9.7)	118 (36.9)	170 (53.1)
14.	I will use stainless steel straw instead of plastic straw when buy beverages.	1 (0.3)	3 (0.9)	37 (11.6)	113 (35.3)	166 (51.6)
15.	I will volunteer to clean up beaches during vacation.	1 (0.3)	3 (0.9)	36 (11.3)	137 (42.8)	143 (44.7)

Table 4.12 shows that 94.06% of the respondents had shown behavioural intentions on reducing microplastics pollution in drinking water sources. About 301 students (94.06%) agreed on reducing microplastics pollution. The respondents from the Jeli campus presented the highest mean percentage in this section, where 184 respondents (57.7%) scored a range of 51 until 75 in total, followed by the Bachok Campus and the Pengkalan Chepa campus. The percentage of high behavioural intentions of the respondents from each campus might have slightly the same percentage due to a lack of commitment from the Bachok and the Pengkalan Chepa campus. The Jeli campus respondents presented the highest percentage with the highest involvement from the Jeli campus respondents. It shows that all the respondents have intentions of reducing the microplastics pollution in drinking water sources.

In general, the respondents' behavioural intentions showed a positive intention towards these microplastics issues. However, they might offer harmful behavioural purposes when they had a personal belief which sacrifices were needed. Many social psychologists pointed out that a positive attitude is affected by primitive beliefs, including a wide range of beliefs and attitudes regarding specific environmental problems. On the other hand, positive behavioural intentions also could come from the shared media (Aminrad et al., 2013) regarding awareness about environmental issues. Therefore, it can be said that a respondent's behavioural intentions on reducing microplastics pollution depended on the level of knowledge and beliefs within themselves.

Table 4.12: Mean percentages of respondents' behavioural intentions based on three campuses.

Campus	Frequency			
	Not at All (%)	**Somewhat (%)**	**Very Much (%)**	**Total (%)**
Jeli	0 (0)	5 (1.5625)	184 (57.5)	189 (59.0625)
Bachok	0 (0)	5 (1.5625)	61 (19.0625)	66 (20.625)
Pengkalan Chepa	0 (0)	9 (2.8125)	56 (17.5)	65(20.3125)
Total (%)	**0 (0)**	**19 (5.9375)**	**301 (94.0625)**	**320 (100)**

Note: N = 320

The variations in overall behavioural intentions were based on gender, campus, and age were examined. An independent t-test was conducted to compare the students' behavioural intentions in reducing microplastics pollution in males and females (Table 4.13). A one-way between-subject ANOVA was conducted to compare the students' behavioural intentions in reducing the microplastics pollution in drinking water sources for gender, campus and age (Table 4.14).

Based on Table 4.13, the significant value for gender was $p = 0.630$, larger than 0.005. Therefore, the factor of gender did not significantly influence the respondents' behavioural intentions towards reducing the microplastics pollution in drinking water sources. The mean of behavioural intentions for male was M = 4.308, SD = 0.592 while female was M = 4.340, SD = 0.541 (Table 4.13). It shows that female students were more concerned about reducing microplastics pollution compared to male students as the mean value for female respondents were slightly higher than the mean of the male respondents.

Table 4.13: Respondents' behavioural intentions based on gender.

Factor		N	Mean	Std. Deviation	t-test	Sig.
Gender	Male	115	4.308	0.592	-0.482	0.630
	Female	205	4.340	0.541		

The highest mean for campus was Jeli campus [F (2,316) = 4.395, p = 0.202] and the lowest mean for campus was Bachok campus [F (2,316) = 3.849, p = 0.202] (Table 4.14). The highest mean for age was between 21-23 years old [F (2,316) = 2.962, p = 0.000] and the lowest mean for age was between 27-30 years old [F (2,316) = 2.000, p = 0.000]. However, these results were not accurate as the number of respondents for age 27 to 30 was only 1 (Table 4.14). A study which has been conducted by Steven (2019) stated that people that aged between 17 to 35 years old were more concerned about the environment. This finding clearly shows that the number of respondents aged between 21-23 years old recorded the highest number of respondents compared to those aged 24-26. However, the age difference should be negligible as this study was conducted on the UMK students, where most of them were aged between 19 to 23 years old.

Table 4.14: ANOVA of respondents' behavioural intentions based on campus and age.

Factor		N	Mean	Std. Deviation	F	Sig.
Campus	Jeli	189	4.395	0.442	1.636	0.202
	Bachok	66	3.849	0.477		
	Pengkalan Chepa	65	4.117	0.480		
Age	18-20 years old	19	2.737	0.452	12.536	0.000
	21-23 years old	288	2.962	0.192		
	24-26 years old	12	2.917	0.289		
	27-30 years old	1	2.000	.		

4.5 Relationship Between the Risk Perception, Concern and Behavioural Intentions

The correlation between risk perception, concern and behavioural intentions was examined. The overall correlation between risk perception, concern and behavioural intentions was moderately positively correlated with each other. The correlation coefficient was between $r = 0.195$ to $r = 0.479$ (Table 4.15).

The correlation between risk perception and concern show positively moderate correlation ($r = 0.479$, N = 320, $p < 0.05$). This study shows that the respondents were aware of the microplastics pollution in drinking water sources. Therefore, the respondents realize that microplastics will pollute the drinking water sources. Hence affect their health. This study's results were acceptable, as a similar study has been conducted by the University of Twente, where they measured the risk perception, psychological distance, behavioural intentions, and concern towards the microplastics issue. From the study, they identified that the variable concern and risk perception were correlated significantly. Based on the findings, the researcher stated that concern was influenced due to the awareness of the microplastics' harmful consequences (Floer & Gutteling, 2019).

Based on Table 4.15, the variable of risk perception and behavioural intentions presented a very weak positive correlation: $r = 0.195$, N = 320, $p < 0.05$. Behavioural intentions are the individual's readiness to perform a given behaviour (Floer & Gutteling, 2019). In this study, the results show a weak relationship between both variables and it can be said that the respondents are aware of the microplastics pollution in drinking water sources. However, they are lack behavioural intentions to engage with the issues. Also, similar findings have been identified by the researcher at the University of Twente, where they stated that the respondents in their study show a

positive relationship between behavioural intention and risk perception (Floer & Gutteling, 2019).

The correlation between concern and behavioural intentions show positively moderate correlation where the value was $r = 0.401$, N = 320, $p < 0.05$. It showed that the variable of risk perception has a strong correlation with the concern variable. Table 4.15 clearly showed that variable concern and behavioural intentions were significantly correlated to risk perception, even though the behavioural intentions were not strongly correlated to risk perception. Research has been conducted by Deng et al., (2020) and based on their study, they stated that the more knowledge the respondents have, the more concerned the respondents are, and the greater role they are willing to play in environmental protection.

This study's results were acceptable, as similar research has been conducted by the University of Twente, where they measured the risk perception, psychological distance, behavioural intentions, and concern towards the microplastics issue. From the study, they identified that the variable concern and risk perception were correlated significantly. Based on the findings, the researcher stated that concern was influenced due to the awareness of the microplastics' harmful consequences (Floer & Gutteling, 2019).

Table 4.15: Correlation between concern, behavioural intentions and risk perception.

Relationship	r-value
Concern and Risk Perception	0.479*
Behavioural Intentions and Risk Perceptions	0.195*
Concern and Behavioural Intentions	0.401*

N = 320

*. Correlation is significant at the 0.01 level (2-tailed).

4.6 Multiple Linear Regression

Table 4.16 shows the model summary, which was used in this study. Based on the Table 4.16, the model gives the value of $R = 0.479^a$, $R^2 = 0.229$ and the value of adjusted $R^2 = 0.224$. R-value represents the correlation between the independent and dependent variables. R's value in this study was approaching 1, which showed a moderately positive correlation between the variables. R^2 shows the variation for the dependent variable that could be explained by the independent variables. A value greater than 0.5 shows that the model is effective enough to determine the relationship between concern and behavioural intentions on the risk perception. However, in this study, the value of R^2 was 22.9 % of the variance for the risk perception. It is possible to be explained by the respondents' concern and behavioural intentions toward microplastics pollution. Adjusted R^2 shows the generalization of the results and in this study, the difference between R^2 value (0.229) and adjusted R^2 was not far off from 0.224, which was good.

Table 4.16: Model summary of multiple linear regression.

Model	R	R^2	Adjusted R^2
1	0.479[a]	0.229	0.224

a. Predictors: (Constant), Concern, Behavioural Intentions

b. Dependent Variable: Risk Perception

ANOVA tables identified whether the model is significant enough to determine the outcome. Based on Table 4.17, the result was substantial as the significance value was 0.000 < 0.05. The F-ratio represents an improvement in predicting a variable by fitting the model after considering the model's inaccuracy. In this study, the F-ratio value was 47.139 and greater than 1. Hence the model was overall significant of the regression analysis.

Table 4.17: ANOVA of multiple linear regression.

Model		Sum of Square	df	Mean Square	F	Sig.
1	Regression	4.893	2	2.447		
	Residual	16.453	317	0.052	47.139	0.000[b]
	Total	**21.347**	**319**			

a. Dependent Variable: Risk Perception

b. Predictors: (Constant), Concern, Behavioural Intentions

The significance value of behavioural intentions was $p = 0.950$, more significant than 0.05. Hence, the variable behavioural intentions gave no significant impact on risk perception. The concern variable significantly influenced the risk perception as the significance value of the variable concern was $p < 0.05$ (Table 4.18).

Table 4.18: Coefficients of risk perception, concern and behavioural intentions.

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	**Std. Error**	**Beta**	**t**	**Sig.**
1	(Constant)	0.910	0.225		4.041	0.000
	Concern	0.677	0.076	0.477	8.871	0.000
	Behavioural Intentions	0.004	0.060	0.003	0.063	0.950

a. Dependent Variable: Risk Perception

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusions

In this study, the level of risk perception of microplastics pollution in drinking water sources from the UMK respondents has been successfully analysed using statistical analysis. More than half of the respondents were agreed with the questions in each section. The respondents show high level of risk perception, concern and behavioural intentions within themselves. Moreover, they were aware and concerned about microplastics pollution, hence have the behavioural intentions on reducing the microplastics pollution in drinking water sources. A different point of view of the respondents from each campus was observed, and all of the respondents show similar feedback, where they were aware and have information regarding this issue. Therefore, the different study backgrounds, such as science and non-science students, did not entirely affect the risk perception, concern and behavioural intentions of the respondents.

The significance between gender, campus, and age were analysed using the independent t-test and ANOVA. From the analysis, respondents' gender was not significant in this study. However, the factor campus and age contributed to the

significance of this study, where it affecting the respondents' risk perception, concern and behavioural intentions on microplastics pollution in drinking water sources.

The relationship between the independent variables and dependent variables were successfully analysed by using Spearman's rho test. All the results show a positive relationship but not a strong relationship. Variable concern showed that it affects the respondents' risk perception, where the higher the level of respondents' knowledge, the more the concern the respondents. Thus, the higher the risk perception of the respondents. However, the behavioural intentions to reduce the microplastics pollution in drinking water sources did not strongly influence the risk perception, as the correlation between variable behavioural intentions and risk perception was not strong. On top of that, most respondents believe that awareness will create intentions to reduce the risk as they have high behavioural intentions to reduce the microplastics pollution in drinking water sources.

Last but not least, the regression analysis was used to observe whether the respondents' concern and behavioural intentions manage to influence the risk perception. However, variable behavioural intentions did not significantly influence the respondents' risk perception compared to variable concern in this study.

5.2 Recommendations

Throughout the study, few recommendations should be taken to improve the studies. The questionnaires should be bilingual to ensure the respondents will clearly understand the context of the questionnaires. The university's management should include at least one subject on environmental education for each program to educate the students on environmental protection. It can be seen that students who learned

environmental education posed high-risk perceptions of the environment. The students should be exposed to environmental education through events and fieldwork related to the environment if they do not have subjects on environmental education.

More research should also be carried out by analysing the impact of microplastics pollution on public awareness and attitudes towards microplastics emission reduction behavior on a large scale. Due to that, more people outside there are not aware of the presence of microplastics pollution. Therefore, more programs such as webinar, talks and sharing sessions by the expert should be taken as an initiative to educate the people and increase their awareness of microplastics pollution.

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APPENDIX A

FACULTY OF EARTH SCIENCE
BACHELOR DEGREE OF APPLIED SCIENCE
(SUSTAINABLE SCIENCE)

Disclaimer:

I am a student of Universiti Malaysia Kelantan (UMK) and presently research "Assessment of Risk Perception on Microplastics Pollution on drinking water Sources". Your responses will be anonymous and will never be linked to the university or you personally. I will not use your name or any information that would allow you and the university to be identified in any presentation or published work related to my study. Kindly fill in the questionnaires below and assure the data you generated shall be kept confidential and for research purposes only. The compiler of the questionnaires has sole ownership of completed questionnaires and the questionnaires will be destroyed after completion of the research. I appreciate your time and generosity. Thank you for your cooperation.

If you have any questions or require more information about the study, please do not hesitate to contact me, Aiza (011-33236534).

QUESTIONNAIRES

Section A: Demographic Part

Direction: Please tick (√) in the box provided below and rate yourself honestly based on what you do give to the statement.

1.	**Gender**	
		Male
		Female

2.	**Age**	
		18 - 20
		21 - 23
		24 - 26
		27 - 30

3.	**Race**	
		Malay
		Chinese
		Indian
		Other
		Other:

4.	**Marital Status**	
		Single
		Married
		Divorce

5.	**Origin State**			
		Selangor		Johor
		Perak		Melaka
		Kedah		Negeri Sembilan
		Perlis		Kuala Lumpur
		Pulau Pinang		Labuan
		Kelantan		Putrajaya
		Terengganu		Sabah
		Pahang		Sarawak

6.	**Educational Level**	
	Undergraduate	
		First Year
		Second Year
		Third Year
		Forth Year
	Postgraduate	

7.	**Faculty**
	FSB
	FBKT
	FIAT
	FTKW
	FAE
	FKP
	FPV
	FHPK

Direction: Please tick (√) in the box provided below and rate yourself honestly based on what you do given to the statement using the following scales.

1- Strongly disagree **2**- Disagree **3**- Neither agree nor disagree **4**- Agree **5**- Strongly agree

Section B: Risk Perception		**Scales**				
		1	**2**	**3**	**4**	**5**
1.	Evidence of the presence of the microplastic in freshwater sources is unreliable.					
2.	I am not sure whether there is microplastic pollution.					
3.	I am uncertain that the degradation of plastics debris contributes to microplastic pollution.					
4.	I consider that microplastics pollution to be an unacceptable risk.					
5.	I do not believe the presence of microplastic is concerning.					
6.	I do not know from where the microplastics sources come.					
7.	I do not understand the meaning of microplastics.					
8.	I do know that microplastics came from plastics degradation.					
9.	I need to learn more information to form a clearer opinion about microplastics.					
10.	I talk to my friends and family about microplastics.					
11.	The presence of microplastics in the freshwater systems scared me.					
12.	I am not aware that the microplastics pollution have become global issues.					
13.	I am sure that the microplastics pollution can affect the ecosystems.					
14.	I know the microplastics pollution will affect the human health.					
15.	Too much fuss regarding the microplastics pollution presence in freshwater systems.					

Direction: Please tick (√) in the box provided below and rate yourself honestly based on what you do give to the statement using the following scales.

1- Strongly not concerned | **2**- Not concerned | **3**- Neither concern nor not concern | **4**- Concern | **5**- Strongly concern

Section C: Concern		**Scales**				
		1	**2**	**3**	**4**	**5**
1.	I am very concerned about microplastics pollution.					
2.	I am concern enough that the plastic debris might harm the environment.					
3.	I am very concerned about plastics pollution which has been a global issue for the past few years.					
4.	I am showing my concern by raising the awareness regarding the microplastic pollution.					
5.	I am concern about plastics pollution when I knew lots of freshwater animals died due to pollution.					
6.	I am showing my concern about the plastics pollution by not throwing the plastics debris into the water.					
7.	I am showing my concern about plastics pollution by spreading information on social media.					
8.	I am showing my concern by bringing a reusable food container instead of using polystyrene.					
9.	I am showing my concern about microplastics pollution by talking about it to friends and family.					
10.	I am showing my concern by cleaning the beach from plastic debris.					
11.	I am concern about microplastics pollution after I knew that it comes from synthetic clothes.					
12.	I am showing my concern by volunteering in the campaign of banning plastics usage.					
13.	I am showing my concern by using stainless steel straw instead of a plastic straw.					
14.	I am concern that plastics pollution will pose threats to animals.					
15.	I am concern that plastic pollution will affect the freshwater ecosystem.					

Direction: Please tick (√) in the box provided below and rate yourself honestly based on what you do give to the statement using the following scales.

1- Not at all **2**- A little bit **3**- Somewhat **4**- Quite a bit **5**- Very much

Section D: Behavioural Intentions		**Scales**				
		1	**2**	**3**	**4**	**5**
1.	I am willing to donate my money to a respected organization cleaning up the beaches and oceans.					
2.	I will bring my food container instead of using polystyrene.					
3.	I will reduce plastic usage to decrease pollution.					
4.	I will use cloth bags rather than plastics bags when shopping.					
5.	I will inform family and friends about the effects of microplastics pollution.					
6.	I will share about the knowledge of microplastics through social media (Facebook, Twitter, Instagram).					
7.	I will volunteer in cleaning up beaches during vacation.					
8.	I want to gather more information regarding the microplastic pollution.					
9.	I want to help in raising the awareness about the plastic pollution.					
10.	I will use reusable bottles that have BPA free instead of plastic bottles.					
11.	I will air dry the wet clothes instead of using the dryer.					
12.	I will participate in the "Ban Plastics Usage' campaign.					
13.	I will use stainless steel straw instead of plastic straw when buy beverages.					
14.	I will say "NO" when people offered me to use plastic cutlery.					
15.	I will avoid using cosmetics products that contain microbeads.					