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The Relationship between Epistemic Style, Environmental Knowledge, Trust in Environmental Scientists and Environmental Behaviour

Matthew Farrugia, BSocSc (Psychology)
4096673

Supervisor: Dr Christine Critchley

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Declaration

"I declare that this report does not incorporate without acknowledgment any material previously submitted for a degree in any University, College of Advanced Education, or other educational institution, and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text. I further declare that the ethical principles and procedures specified in the Faculty of Life and Social Sciences Human Research Ethics Committee document have been adhered to in the preparation of this report."

Name: Matthew Farrugia

Signed: ______________
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Abstract

The present research aimed to examine the effects of individual's epistemic style on environmental knowledge, trust in environmental scientists, and subsequently pro-environmental behaviour. The study was comprised of 149 participants who completed an online questionnaire utilising measures of epistemic style, trust, knowledge and behaviour. Epistemic style was assessed by the Epistemic Preference Indicated (EPI; Eigenberger, Critchley & Seander’s, 2007) which measured two negatively related dimensions named the Intellective Position (IP; a preference for elaborated forms of thinking) and the Default Position (DP; a preference for automatic forms of thinking). The results supported the hypothesis that having a preference for the IP would positively predict environmental knowledge and subsequently high levels of pro-environmental behaviour while having a preference for the DP would negatively predict environmental knowledge, and subsequently low levels of pro-environmental behaviour. Contrary to expectations, differences in epistemic style were not predictive of trust in environmental scientists, however trust in environmental scientists did predict pro-environmental behaviour. Suggestions for future research include exploration of ways in which a preference for the DP could be shifted to a preference for the IP to encourage pro-environmental outcomes in conjunction with assessing the generalisability of the current results to other forms of pro-social behaviour.
Chapter 1: Introduction

More than 30 years ago, environmental scientists stated that it was uncertain when the Earth’s environmental deterioration would reach the point of no return (Maloney & Ward, 1973). However, due to land occupancy, ocean contamination, small particle air pollution, radioactive waste release and mineral depletion, they postulated that this ecological disaster would occur around the turn of the century. In their own words, they described the situation as a disaster and a crisis ‘of [human] maladaptive behaviour’ (Maloney & Ward, 1973, p. 583). Later in 1990, Schahn and Holzer advised that there is no doubt today regarding the dramatically increasing severity of the environmental crisis. In 2000, Oskamp summarised the extreme dangers currently facing the Earth’s environment as being global warming, climate change, acid rain, ozone depletion, exhaustion of the world’s fisheries, decreasing agricultural productivity and toxic pollution of air and water. He recommended that the social sciences must play a vital role in the fight against these problems, as they are all ‘caused by human behaviour’ (Oskamp, 2000, p. 375).

From the above examples, it is evident that one of the most serious long-term dangers facing humanity is the risk that human actions are producing irreparable changes to the Earth’s environmental systems that sustain life. Potentially, the conditions on Earth could become so hostile that there may no longer be a place for our future generations to live. Psychologists, with their expertise in behaviour change, can play a key role in decreasing
environmentally destructive human behaviours. As such, one of psychology’s
goals in tackling this problem is to find out what predicts human pro-
environmental behaviours. Thus, the focus of this thesis is to attempt to partly
answer the question: why is it that some people engage in pro-environmental
behaviour, while others do not?

1.1 Psycho-social predictors of environmental behaviour

A recent comprehensive meta-analysis by Bamberg and Moser (2007)
assessed various models and their relative success in predicting environmental
behaviour. The authors viewed pro-environmental behaviour as motivated by a
combination of self-interest (to engage in behaviour that minimises one’s
personal risk or expands one’s fortune) and concern for the welfare of others
(for example, subsequent generations, other species, entire ecosystems). Both of
these motivations imply having knowledge of what would benefit an individual
the most, or knowledge regarding the situations faced by others. This
combination of self-interest and pro-social motivations is reflected by the
theoretical models that are most often applied in attempts to explain pro-
environmental behaviour. The researchers that believe pro-environmental
behaviour to be largely predicted by pro-social motivations frequently employ
Schwartz’s (1977) Norm-Activation Model (NAM) as a theoretical framework.
Those researchers who view environmental behaviour as mainly influenced by
self-interest commonly utilise theories of rational choice such as Ajzen and
Fishbein’s (1969) Theory of Reasoned Action which was later extended into the Theory of Planned Behaviour (TPB; Ajzen, 1991).

The NAM’s basic premise is that moral norms are direct determinants of pro-social behaviour. Moral norms were conceived by Schwartz (1977) as being feelings of deep moral obligations that compel people to act pro-socially. Aligned with this theory are several key studies that give supporting evidence to the hypothesis that moral norms directly contribute to pro-environmental behaviour. These studies focused on issues such as resource conservation (Black, Stern & Elworth, 1985), recycling (Guagnano, Stern & Dietz, 1995), transport choice (Hunecke, Blohbaum, Matthies & Hoger, 2001) and environmentally friendly buying (Thogersen & Olander, 2006).

In contrast, the TPB’s main thesis contends that people are motivated to avoid punishments and to seek reward. Thus, according to Azjen’s (1991) TPB, decision making is directed by rational assessment of the behavioural consequences of various choices. This assumes that an individual has knowledge of the consequences of these choices. That is, the calculation of perceived positive consequences versus perceived negative consequences determines the global attitude towards a behavioural option (Bamberg, Ajzen & Schmidt, 2003). Some significant studies that provide evidence that the TPB predicts pro-environmental behaviour are studies on conservation (Corbett, 2002), recycling (Knussen, Yule, MacKenzie & Wells, 2004; Mannetti, Pierro & Livi, 2004), transport choice (Bamberg et al., 2003) and environmentally friendly marketing (Kalafatis, Pollard, East & Tsogas, 1999).
More recently, Bamberg and Moser (2007) attempted to integrate both the NAM and the TPB theoretical models, with the purpose of analysing the “interplay of knowledge and behavioural constraints/opportunities, as well as the personal values and motives in influencing the decision to behave in a pro-environmental way” (Bamberg & Moser, 2007, p. 15). The researchers performed a meta-analysis on 46 studies reporting results from 57 independent samples, with the single criteria for inclusion based on whether the studies employed variables that fit into the author’s theoretical model – a combination of the NAM and the TPB. The final model developed used a meta-analytic structural equation model (MASEM) which included eight psycho-social variables as predictors of environmental behaviour, each of which will be briefly described in turn.

The opening five variables made up those that were included from the NAM theoretical framework. The process was theorised by Bamberg and Moser (2007) to begin with problem awareness, which represented an individual’s knowledge of the environmental situation, including the scope or magnitude of the problem, and the ways an individual can make a difference. Theoretically, the internal attribution variable was closely aligned with the feelings of guilt variable, as when an individual accepts responsibility for the current environmental predicament they will often experience feelings of guilt at inadvertently being a part of the problem.
Figure 1. NAM and TPB integrative model of psycho-social variables and their relationship with pro-environmental behaviour.

Note: Figure obtained from Bamberg and Moser (2007)
The social norm variable for Bamberg and Moser reflected instances where there is a perceived incongruence between a person's own behaviour and what the rest of society is perceived to be doing, which could also lead to guilt. The previously described variables are all theorised to be directly predictive of moral norms, which are personal standards of what is right or wrong in a given context.

The next three constructs came from Ajzen’s (1991) TPB, and were theoretically integrated into Bamberg and Moser’s (2007) study after the initial five variables. The TPB is based on a more rational-choice representation of human beings which assumes that people are motivated to seek pleasure and rewards while avoiding punishment. Decision making is thus directed by a rational assessment of behavioural consequences (Bamberg & Moser, 2007). Bamberg and Moser conceptualised the inclusion of the TPB into their model by theorising that the sum of perceived positive and negative consequences can establish global attitude’s towards a behavioural option. The TPB also emphasises the importance of situational constraints on behaviour. When an individual forms their behavioural intention, they not only account for their own attitude but also estimate their ability to execute the behaviour, which represents an individual’s perceived behavioural control (PBC) (Bamberg & Moser, 2007). All the previously mentioned seven variables were theorised to predict an intention to perform environmental behaviour, which subsequently can predict actual behaviour.
As can be seen from Figure 1, 27% of the variance in environmental behaviour was explained in Bamberg and Moser’s (2007) MASEM by the eight psycho-social variables. The author’s results empirically confirmed their hypothesis that behavioural intention mediates the association of all other psycho-social variables with pro-environmental behaviour. Of note is that problem awareness was the greatest contributor of variance to the variables of social norm, feelings of guilt, internal attribution and moral norm. These in turn were the direct determinants of the three other psycho-social variables that predict intention and finally predict behaviour. As such, problem awareness may be seen as an essential component in the eventual prediction of pro-environmental behaviour through the other mediating variables. Interestingly, whilst seven of the psycho-social variables do not directly contribute to the variation in behaviour, 52% of the variance observed in intention was explained by the other seven variables, so their importance in the model should not be underestimated.

Apart from the empirical justification for the importance of problem awareness in the eventual prediction of pro-environmental behaviour, there is also a theoretical argument that supports this contention. In line with the NAM theory (Schwartz, 1977), problem awareness is categorised by knowledge of the scope, nature and characteristics of the problem. Problem awareness has an impact upon pro-environmental behaviour because it increases certain people’s adherence to social norms and can lead to internal attributions, which in turn influences guilt that activates moral norms. In line with Ajzen’s TPB (1991)
theory, knowledge of the problem allows people to evaluate their PBC in reference to performing certain environmental actions, which in turn predicts their attitudes towards pro-environmental behaviours, and thus an intention to act in a pro-environmental way is triggered. Consequently, as a key contributor of variance in Bamberg and Moser’s (2007) MASEM, as well as being theoretically significant, problem awareness/environmental knowledge can be viewed as an integral component in the eventual prediction of pro-environmental behaviour.

1.2 Knowledge as a predictor of behaviour

Indeed, knowledge or information about a given course is considered crucial to successful action. From an early age we learn the rules and formulae to perform simple mathematics and reading. When approaching end of year exams, students generally spend many hours studying information with the intention of performing well in their examinations. Consistent with this, knowledge and awareness raising campaigns have always been a popular way of promoting certain behaviours in the general public (Frick, Kaiser & Wilson, 2004). In road safety education, knowledge of the consequences of speeding and driving under the influence of alcohol is provided to convince people to avoid harmful driving behaviours (for information, see TAC, 2007). In a health example, dietary information is often taught to students with the hope of promoting healthier eating patterns and preventing the development of eating disorders (for a review, see Eertmans, Baeyens & Van den Bergh, 2001).
In these instances, knowledge is viewed as a necessary precondition for successful action. In the case of environmental behaviour, many researchers have conducted studies to test the capacity of knowledge to predict behaviour. However, these studies have had mixed outcomes, with some studies having reported very weak correlations between environmental knowledge and pro-environmental behaviour (e.g., Bögeholz, 1999; Langeheine & Lehmann, cited in Schahn & Holzer, 1990), while others have shown that knowledge can directly predict environmental behaviours (e.g., Frick et al., 2004; Hines, Hungerford & Tomera, 1986).

Frick et al. (2004) contended in their study on the interplay of different forms of environmental knowledge, that with a better understanding of the interrelationship between different types of knowledge, the goal of changing environmental behaviour in the general public would become more scientifically informed and more importantly, increasingly effective. The authors explained that before an individual can act effectively to promote the well-being of the environment, they must have some understanding of the natural states of ecosystems and the processes within them (system knowledge), and subsequently know what can be done to fix a problem (action-related knowledge). A third form of knowledge is effectiveness knowledge, which involves knowing how effective taking a particular course of action might be. The author’s measured these three forms of knowledge and tested if they predicted conservation behaviours spanning six domains, including energy conservation, mobility and transportation, waste avoidance, consumerism,
recycling and various social behaviours towards conservation. Frick et al. found that system knowledge alone determined 29% and 5.2% of the variance found in action-related knowledge and effectiveness knowledge respectively, which together directly predicted roughly 6% of environmental behaviour.

In contrast, a study by Bögeholz (1999) found a very weak association between environmental knowledge and behaviour. Knowledge was measured across five different criteria, with two specific and three more global variables. The specific variables included assessment of knowledge of plant species and animals while the global variables consisted of knowledge about ecological concepts on global life support systems, as well as action-specific environmental knowledge. Of the five variables, only knowledge concerning global life support systems and action-specific environmental knowledge contributed significantly to behaviour in the author’s theoretical model. However the beta weights were extremely weak, both being below .08. This means that they at best predicted only .58% (.076 x .076) of the variance in behaviour measured, showing knowledge to be a very weak direct indicator of environmental behaviour.

A hypothesis that served to address the inconsistency between the results of these two (and other) studies was proposed by Barkman and Bögeholz (1999). They contended that merely having environmental knowledge is not enough to predict environmental behaviour by itself. Rather, environmental behaviour may be in part determined by a person’s higher-order cognitive skills. These skills were postulated by Barkman and Bögeholz to enable
individuals to judge and choose correct strategies in order to be able to tackle sometimes highly complex environmental problems. Thus, environmental knowledge is an important, but not sufficient, factor in the prediction of pro-environmental behaviour.

To date there have been no studies that have included Barkman and Bögeholz’s (1999) higher-order cognitive skills in conjunction with environmental knowledge to measure their relationship with environmental behaviour. As a first step in examining the effects of these higher-order cognitive skills on environmental behaviour, it would be useful to have the ability to distinguish between individuals that are more likely to employ more elaborated forms of thinking, with the objective of being able to measure how the use of higher order cognition can predict environmental knowledge and subsequently pro-environmental behaviour.

1.3 The role of an individual’s epistemic style

A person’s epistemic style is a possible individual difference variable that differentiates between people who are more likely to use higher-order cognitive skills and people who are more likely to use less-order cognitive skills. The term epistemic is derived from the word episteme, which is defined as “a system of understanding or a body of ideas which give shape to the knowledge of that time” (Webster, 1985). An epistemic style or preference has been conceptualised as being a person’s routine or favoured method in deciding on an option, or problem solving, which is ultimately derived from their theory
of knowledge (Eigenberger, Critchley & Sealander, 2007). Epistemic style is considered by Eigenberger et al. to be a component within cognitive style. Cognitive style is conceived as encompassing a general array of perception and disposition-based individual differences. These have been measured, for example, as field dependence-independence (Witkin, 1962), levelling-sharpening (Holzman & Klein, 1954), and impulsivity-reflectivity (Kagan, 1965). In comparison epistemic style more specifically refers to the ways in which one implicitly defines knowledge, and acquires, applies, and justifies beliefs. It is suggested that the structural source of epistemic style consists of fundamental cognitive processes involved in the construction, evaluation, and application of beliefs, which are motivated by the informational needs inherent in problematic situations (Eigenberger et al., 2007). Therefore, different cognitive processes and mechanisms are motivated or activated when there is a particular need. For example, performing specialised mathematics would motivate an individual to employ more complex and thoughtful thinking strategies as compared to placing the square peg into the square hole.

Consistent with dual-process notions of cognitive function, epistemic style is assumed to be a manifestation of an information processing preference (Eigenberger et al., 2007). The concept of dual cognitive processing refers to the theory that people can either process information in a careful, systematic way, or, in a faster, cognitively ‘easier’ way, based on the given situation (Petty & Cacioppo, 1986). Accordingly, preference is given to processes that, in essence, either expand or restrict the number of inferential operations likely to
be applied to the information at hand. Aspects of the person or situation are thought to predict which mode of processing a person will employ (Ferreira, Garcia-Marques, Sherman & Sherman, 2006).

In the past three decades there have been a number of investigations into certain features of dual-process cognitive models, which are usually illustrated as opposing pairs, such as ‘experiential-rational’ (Epstein, 1990), ‘heuristic-systematic’ (Chaiken, 1980), and ‘natural-extensional’ processes (Tversky & Kahneman, 1983). To date, various conceptualisations of epistemic style have been founded on the differences between discrete theories of knowledge such as Gold and Reimer’s (1974) thinking and feeling; Royce and Mos’s (1983) rationalism, empiricism, and metamorphism; and Erwin’s (1983) dualism and relativism. However, the conceptualisation of epistemic style being measured in the present study has been based on the philosophical grounds of Plato’s famous contrast between opinion and knowledge, or Hume’s (1739/1967, 1777/1955) distinction between common and reflective ways of knowing (Eigenberger et al., 2007).

In this sense, Eigenberger et al.’s (2007) epistemic style can be interpreted as measuring two fundamental negatively related positions, and can therefore be referred to as an epistemological dualism. Eigenberger et al. were keen to stress that the dualism of epistemic style they proposed was not between specific philosophical theories, but rather between reflective, philosophical thought itself, and its antithesis. The two opposing epistemological dimensions were termed the ‘Intellective Position’ (IP) and the ‘Default Position’ (DP).
These two dimensions form a person’s epistemic style, and thus the scale used to measure epistemic style developed by Eigenberger et al. provides both an IP and a DP score for the individual. However, while a person can theoretically have a both a high preference for the IP and a high preference for the DP, people generally tend to have a preference for one style over the other (Eigenberger et al., 2007). A preference for the IP suggests a general preference for elaborated forms of thinking and judgement (philosophical thought). A preference for the DP suggests a general preference for thinking, learning and problem solving strategies that function relatively automatically or with little effort (the antithesis of philosophical thought). A person who has a preference to tackle problematic situations through the IP would tend to employ critical thinking and other judicious strategies in response. Alternatively, an individual who prefers to confront problematic situations through the DP would tend to choose the path of least resistance, often employing strategies such as heuristics, which are so-called mental ‘shortcuts’ (for example, stereotypes, biases) to guide them in their decision making. As such, epistemic style can be thought of as an individual difference variable that can determine the people who tend to employ either higher-order or lower-order cognitive skills.

Thus, people who have a preference for the IP would tend to generally think more deeply about things than people who have a preference for the DP. An example of an individual that has a preference for the IP might be someone who investigates the policies and previous decisions made by candidates running for an election, weighs that information up against the information
obtained from the election debate, and subsequently bases their votes on the best alternative. A parallel example for an individual who has a preference for the DP epistemic thinking style would be an individual who when faced with voting in a federal election approaches the situation with a high level of dogmatism, by voting for the one party for their entire life, because that is who their parent’s voted for. This type of dogmatic response is typical of a person who has a preference for the DP, as Eigenberger et al. (2007) found DP to be highly correlated with the construct of dogmatism. It is logical to presume that those people who think more deeply, critically and logically about issues and/or topics would have a greater knowledge on them than those who do not think so deeply and/or rationally about the same issues and topics. Thus, it is an assumption of the present study that those people who have a preference for the IP will have a greater knowledge base, in general, than those people who have a preference for the DP.

Eigenberger et al. (2007) administered the EPI which consisted of subscales that measured IP and DP to an American sample of 1085 participants. The study examined separate community and university sub-samples drawn from the overall sample. There was a significant difference between DP and IP scores within the community sample with the mean difference for the DP being higher than that of the IP. There was also a significant difference between the IP and the DP mean score within the university sample, with the IP score being significantly higher than the DP score. In addition, the mean difference between IP and DP for both the sub-samples was greatest within the community sample.
Overall, the mean total score for the IP was significantly lower than the mean score for the DP. Thus, these results pointed to a higher preference for the DP epistemic thinking style within Eigenberger et al.’s sample.

This finding may be one reason why knowledge has been shown to only weakly predict behaviour if at all in previous studies (e.g., Bögeholz, 1999; Frick et al., 2004). This is due to the rationale that people who have a preference for the DP would tend to have relatively low knowledge on issues and subsequently perform lower amounts of pro-environmental behaviour.

Bögeholz’s (1999) sample included students aged between 10 and 17 years of age. These participants were not yet mature adults and as such they still may have been heavily influenced by their parents and their teachers; a characteristic which would be indicative of high scores on the DP and low scores on the IP. Frick et al.’s study attained a large community sample of 2736 German-speaking Swiss participants with whom basic education was under represented when compared to the broader Swiss population. This is also an indication of a sample that may have had an overall preference towards the DP epistemic thinking style, as Eigenberger et al.’s (2007) community sample was also under educated, and they had a preference towards the DP. Therefore, if the samples employed had a preference towards the DP, and it is assumed that IP predicts the use of knowledge in decision making and action, it is likely that knowledge would only show as a weak predictor of behaviour, as it is theorised that people who have a preference for the DP either do not have the requisite knowledge, or are not inclined to use it. Therefore the present study will
attempt to clarify whether IP positively predicts the amount of knowledge and the use of it when deciding on behaviour compared to DP which it is theorised will negatively predict environmental knowledge and subsequently environmental behaviour.

1.4 Social influence and trust as predictors of behaviour

A pertinent question that may be raised is: how do people who have a preference for the DP epistemic thinking style make decisions or perform behaviours without weighing up the positives and negatives about what any given decision or behaviour will achieve? Social psychologists have long proposed that people make decisions based on social influence. As early studies on conformity have shown (e.g., Sherif, 1936), social influence is a process whereby attitudes and behaviours are influenced by the real or implied presence, attitudes or behaviours of other people (Cialdini & Goldstein, 2004). Conformity is based on the premise that people have a need to be certain and confident in what they are doing. In a classic study on conformity, Sheriff (1937) argued that people use the behaviours of others as a frame of reference of the range of possible behaviours in a given situation. The behaviour that represents the average position taken is perceived as being more correct than extreme positions, and as such people tend to adopt them.

Social psychologists commonly refer to a process of social influence that is responsible for conformity (Sherif, 1936), known as informational influence. Informational influence occurs in situations where people copy
perceived knowledgeable others to determine their behaviour in the absence of their own information on the issue (Cialdini & Goldstein, 2004). The people that are perceived as knowledgeable act as sources of information that (it is assumed) know what they are doing - thus a safe course of action is followed. Informational influence arises most often when a situation is ambiguous (where choices exist but people are unsure of which to choose), when there is a crisis (denoted by time pressure on making a decision), and when others are experts. Furthermore, it has been proposed that effective informational influence can result in true cognitive change (Cialdini & Goldstein, 2004). Therefore, not only do certain people defer to expert’s judgements, they may also take on the expert’s opinions to be their own.

The major environmental issues that face the Earth are quite ambiguous, in that the main human causes of the calamity are happening on such a large, worldwide scale, that it is very difficult for any one individual to fully grasp. An example would be the Australian people, who in general are yet to witness the massive destruction to the environment that Europeans are enduring (for example, see Láng, 2003). The criterion of there being a crisis is palpably met in that the nature of these issues implies the potential to drastically alter humanity’s existence on Earth. In terms of time pressure, it has been posited that we will be feeling the effects of the impending environmental crisis in the next few decades, which is, geologically speaking, not even a millisecond in the Earth’s roughly four and a half billion year life. Alternatively, a few decades to an individual could seem like a long time, when compared to the immediacy of
a bushfire in the summer or end of semester exams. Finally, there are many ‘experts’ on environmental issues, from sociologists who study human population issues through to natural scientists who study amphibians for indications of pollution levels. Also, there are the more broadly termed ‘environmental scientists’, who are the general experts on the problems facing the Earth. They are ‘experts’ on environmental issues as they would have a much greater understanding of the nature of the environmental situation than the lay person.

Taking into account the definition of informational influence and the fact that the environmental issue does fit the conditions under which informational influence is likely to arise, it is reasonable to theorise that people who do not have a high knowledge of environmental issues will trust and follow those whom they deem to have the key information on the matter. It has been argued that trust only occurs between known specific individuals who can understand the risks and benefits associated with the trustee (e.g., Hardin, 2002). However, others have shown that there are situations where people put a globalised form of trust (social trust) in generalized others (such as ‘the government’) that does not depend on having the specific information on the positives and negatives of that trust relationship (e.g., Levi, 1998; Sztompka, 1999). In line with informational influence theory and the above conceptualisation of social trust, it would seem that people who do not have the requisite information or the inclination to make a decision on their own (people
with a preference for the DP) would trust generalized others who they thought had the essential information on the issue.

As mentioned above, without detailed information on certain individuals or groups, trust in them can still occur. However, when trusting generalized others, trust functions as a heuristic serving to assist individuals in minimising the complexity of the social world (Critchley, In Press), as opposed to being a clear cut informant in what or what not to do. Thus, it is likely that those people who have a preference for the DP epistemic thinking style will tend to use trust in generalized others who are viewed as having the key knowledge on the issue under scrutiny to inform them of the behavioural options they should take. People who have a preference for the DP generally tend to choose the path of least resistance, by making cognitively ‘easy’ choices. Thus, these people should be far more likely to conform to social pressures and influence when compared to people who have a preference for the IP, who are characterised as being more likely to find out, and subsequently analyse, information themselves rather than simply relying on cues from others. However, that is not to say that people who have a preference for the IP do not use trust to help them in making a decision. It would be prudent to use any reputable information at hand to make the best possible decision, so people who have a preference for the IP would probably use trust in experts, as well as the knowledge they have gained through their own research in making an informed decision about behaviour. This rationale, of knowledgeable people trusting experts in the field that they are informed in, is supported by Nisbet’s (2005) research which assumed that
better understanding of an issue automatically translates into increased public support for the experts in that field.

1.5 Aims and hypotheses

Figure 2 represents the hypothesised model the present study will examine. The study explored possible reasons why some people engage in pro-environmental behaviour while others do not. The thesis of the present study was that individual differences in epistemic style, which are thought to indicate greater preference for either critical and logical problem solving (IP) or quicker, more automatic decision making (DP) (Eigenberger et al, 2007), might provide part of the answer as to why some people perform more pro-environmental behaviours than others.

Figure 2. The present study’s theoretical model of epistemic style predicting knowledge, trust and subsequently behaviour.

Note: IP refers to Intellective Position, DP refers to Default Position
It has been reasoned in the present study that those people who employ elaborated forms of thinking and judgement in understanding and tackling issues would have a greater knowledge regarding issues than those people who prefer to tackle various issues more or less automatically or effortlessly, using mental short-cuts. Consequently, it was hypothesised that IP will positively predict environmental knowledge and DP will negatively predict environmental knowledge, with environmental knowledge in turn positively predicting pro-environmental behaviour. Specifically, environmental knowledge was anticipated to mediate the relationship between individuals’ epistemic style and their pro-environmental behaviour. Additionally, trust in experts has been shown to influence decision making (Critchley, In Press) and people with a preference for the DP would be likely to conform to informational influence due to their assumed lack of knowledge or their antipathy to use the knowledge they have acquired in decision making. Therefore, they would tend to have trust in those people whom they perceived had the knowledge on the issue at hand to inform their behaviour. Accordingly, it was also hypothesised that people who had a preference for the DP would trust environmental scientists, which would be a positive predictor of their pro-environmental behaviour. Additionally, people with a preference for the IP epistemic thinking style would tend to employ trust in environmental scientists in helping inform their decision making due to their knowledge, as it has been shown by Nisbet (2005) that better understanding of an issue translates into increased public support for the experts in that field. Consequently, trust in environmental scientists was
expected to mediate the relationship between an individual’s epistemic style and their pro-environmental behaviour, with greater scores on the DP variable predicting higher scores on trust in environmental scientists which would in turn predict higher levels of pro-environmental behaviours. Greater scores on the IP variable would predict higher scores on the environmental knowledge variable, which would subsequently predict higher trust in environmental scientists, which would in turn positively predict pro-environmental behaviour.
Chapter 2: Method

2.1 Participants

Participants in the study included 149 respondents, with ages ranging from 18 to 70+ years. Participation was via an online survey where participants were invited to take part by emails which had a link to an online questionnaire and was distributed to the author’s personal contact list (Appendix A). Furthermore, participants were asked to forward the email on to other people in their own contact lists if they so wished thereby creating a snowball effect.

Participants responded to a series of demographic questions (Appendix C) regarding their age, gender, Australian citizenship, education and employment status. Participants had a mean age of between 25 and 29 years of age, with 10 participants being between 18 and 20 years of age and one participant being over the age of 70. There were 77 males (51.7%) and 72 females (48.3%), with 131 (87.9%) Australian participants. The sample was well educated, with 58 participants having completed some form of tertiary education, 26 having completed post-graduate study (56.3% of the sample combined), 27 (18.1%) having completed secondary school study, 15 (10.1%) having completed a diploma qualification and two (1.3%) reported having completed a trade qualification. Finally, 73 (49%) were employed in full-time work, 32 (21.5%) were employed in a casual capacity, 18 (12.1%) were employed in part-time work, 12 (8.1%) were self-employed, and 14 (9.4%) were unemployed or retired.
2.2 Materials

Participants completed an online questionnaire containing a battery of self-report scales. The program ‘OPINIO’ was used to design and present the measures on the internet. The scales employed in the present study are described below in order of completion, and the full questionnaire is attached in the appendices.

2.2.1 Epistemic style

Epistemic style was measured by Eigenberger et al.’s (2007) self report Epistemic Preference Indicator (EPI). The EPI consists of 36 items, 18 indicators for each of the two epistemic preferences; Intellective Position (IP) and Default Position (DP). To facilitate a representation of the two dispositional tendencies, an anchoring statement common to both IP and DP questions was used, such as ‘In most learning situations I like it better if…’. This was then followed by oppositional statements that were constructed as scaled sentence completions representing IP and DP, such as ‘topics involve theories and open questions that have no sure answers’ (for IP) and ‘topics are concrete and provide information that is obvious and useful’ (for DP). Each item is measured on a 5-point Likert-type scale (1 = Disagree to 5 = Disagree) with separate results obtained from the average of 18 individual responses for the participants’ IP and their DP. Each IP and DP item is averaged to obtain two total scores, with each having a theoretical range of one to five. A high score on each represents high IP and high DP. Both IP and DP showed high reliability
in Eigenberger et al.’s study, with alpha coefficients being at .91 and .90 respectively. Furthermore, IP and DP showed high test-retest reliability (.94 and .90 respectively) and excellent to good construct validity. In addition, the present study also found the variables of IP and DP to have good internal consistency, with alpha coefficients of .89 and .85 respectively. The EPI is attached as Appendix D

2.2.2 Environmental knowledge questionnaire

The Environmental Knowledge Questionnaire (EKQ) was developed by Frick et al. (2004). The EKQ comprises 60 items and measures three types of environmental knowledge: System Knowledge (21 items), Action-Related Knowledge (20 items) and Effectiveness Knowledge (19 items). System knowledge customarily deals with questions regarding the operation of ecosystems (e.g., Schahn & Holzer, 1990) or to environmental issues awareness knowledge (Bamberg & Moser, 2007). Frick et al. (2004) suggest a typical example as knowledge of the relationship between carbon dioxide (CO₂) and global climate change.

According to Frick et al. (2004), where system knowledge is ‘knowing what’, action-related knowledge is ‘knowing how’. The authors based their definition of action-related knowledge on Ernst’s (1994, cited in Frick et al., 2004) conceptualisation: that action-related knowledge denotes knowledge of behavioural options and possible courses of action. Additionally, whilst people may know that CO₂ contributes to global climate change (system knowledge);
they still may not know what actions or behaviours to perform to reduce their CO₂ emissions (action-related knowledge).

Differing pro-environmental behaviours have different pro-environmental consequences. As such, having the effectiveness knowledge of different types of behaviours would help in determining the best possible environmentally friendly course of action. For example, if a person was aiming to be environmentally friendly, knowing that using cold water in a washing machine was better for the environment than using warm water (other effectiveness facts of pro-environmental behaviours towards water can be found at Powerwater, 2007) would be beneficial in their eventual choice of water temperature. Effectiveness knowledge is about knowing how to get the greatest environmental benefit from an action (Frick et al., 2004).

There were correct and incorrect choices in all of the items included in the EKQ, a score of one was attributed to the respondent for each correct answer and a score of zero was attributed to the respondent for each incorrect answer. Forty-four of these items were presented in a multiple-choice design, of which 11 items allowed multiple responses. That is, participants were able to choose more than one answer, and receive a score of one for each correct answer. Another 16 items were presented as dichotomous true or false statements (see Table 1 for item examples). Four items on the questionnaire were changed from European focused environmental knowledge questions to more Australian focused environmental knowledge questions.
Table 1
Example Items for Each Knowledge Type as Measured by the EKQ

<table>
<thead>
<tr>
<th>Knowledge type</th>
<th>Multiple-choice format</th>
<th>True/false format</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Knowledge</td>
<td>What causes wind?</td>
<td>The coral of the Great Barrier Reef is very resistant</td>
</tr>
<tr>
<td>(21 items)</td>
<td>a) Thrust of clouds</td>
<td>to external influences such as global warming</td>
</tr>
<tr>
<td></td>
<td>b) Temperature difference</td>
<td>(true/false)</td>
</tr>
<tr>
<td></td>
<td>c) Differences in air pressure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>d) Ocean currents</td>
<td></td>
</tr>
<tr>
<td>Action-related knowledge</td>
<td>Ecologically speaking, which of the following types of water use are contribute to global warming</td>
<td></td>
</tr>
<tr>
<td>(20 items)</td>
<td>a) Use of groundwater as drinking water</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Use of lake water as drinking water</td>
<td>(true/false)</td>
</tr>
<tr>
<td></td>
<td>c) Use of water power to produce energy</td>
<td></td>
</tr>
<tr>
<td>Effectiveness knowledge</td>
<td>For every tonne of wood that grows (trees), how much carbon dioxide is removed from the atmosphere?</td>
<td></td>
</tr>
<tr>
<td>(19 items)</td>
<td>a) 0.5 tonnes</td>
<td>It takes only half the energy to produce recycled paper</td>
</tr>
<tr>
<td></td>
<td>b) 1 tonne</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) 1.5 tonnes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>d) 2 tonnes</td>
<td></td>
</tr>
</tbody>
</table>

The results for system knowledge were averaged across the items resulting in a theoretical range of zero to 25. Higher scores pertained to a greater level of system knowledge. The results for action-related knowledge
were also averaged across the items resulting in a theoretical range of zero to 25, with higher scores pertaining to a greater level of action-related knowledge. The results for effectiveness knowledge were averaged across the items resulting in a theoretical range of zero to 19, with higher scores pertaining to a greater level of effectiveness knowledge. Frick et al. (2004) found that system knowledge, action-related knowledge and effectiveness knowledge had alpha reliabilities of .67, .66 and .50 respectively. Coupled with its low internal consistency, Frick et al. found that effectiveness knowledge had a weak factor loading. However, as all the three variables had an acceptable combined total knowledge alpha reliability of .71, and as the scale was deemed to have an excellent content validity accessing a broad range of indicators of knowledge, the measure was still deemed to be a valuable tool and was therefore employed in the present study. In the current study, system, action-related and effectiveness knowledge yielded similar alpha reliabilities of .69, .64 and .52 respectively. The EKQ is attached as Appendix E.

Additionally, participants were asked to rate their awareness of current environmental issues, to test whether people could adequately appraise their own level of environmental knowledge. Twenty-seven participants (18.1%) indicated that they had either ‘low’ or ‘very low’ environmental knowledge. Seventy-three participants (49%) rated their current environmental knowledge awareness as ‘medium’ and 49 participants (32.9%) rated their awareness of current environmental issues as either ‘high’ or ‘very high’.
2.2.3 Trust in environmental scientists questionnaire

The Trust in Environmental Scientists Questionnaire (TESQ) was based on Critchley’s (In Press) perceived motivation and competence of scientist’s survey. The questionnaire was used in an identical way to Critchley (In Press) apart from replacing stem cell scientists with environmental scientists. A total of 18 items were used to determine the perceived motivation and competence of environmental scientists. The responses were measured on a 5-point Likert-type scale (1= None to 5= Most). A total of six items each were designed to measure three aspects of the perceived self interest, benevolence and competence of environmental scientists. Participants responded to the TESQ by indicating how many environmental scientists they thought demonstrated an attribute (for example, benevolence: ‘…want to make life better for ordinary people?’; competence: ‘…are truly interested in finding out about the things they study?’; self-interest: ‘…motivated to win prizes and awards’). The scores for each variable consisted of the sum of each of the variables indicators averaged, with scores ranging from six to 30. High scores on the self-interest variable pertained to people perceiving environmental scientists as being highly motivated by their personal gain, such as through money, prizes or awards. The self-interest variable is negatively indicative of trust in environmental scientists, with high scores indicating distrust and low scores indicating trust. High scores on the benevolence variable pertained to people perceiving environmental scientists as being highly motivated by engaging in research to contribute knowledge or to
help others. High scores on the competence variable pertained to people perceiving environmental scientists as being highly intelligent, talented and trained, as well as how interested and curious they are for their work.

The variables of benevolence and competence were both indicators of the latent variable trust in environmental scientists as high scores on the two variables was indicative of high trust, and low scores indicative of low trust (see Table 2 for the actual attributes). In Critchley’s research, all three sub-scale reliabilities were at or above .86, indicating good internal consistency. In the present study, competence, self-interest and benevolence also had good internal reliability with alpha coefficients of .85, .82 and .87 respectively. The TESQ is attached as Appendix F.

2.2.4 The pro-environmental behaviours scale

The Pro-Environmental Behaviours scale (PEB) was developed by Australian researchers Casey and Scott (2006). The scale comprised 17 items used to determine the quantity of environmental behaviours people undertake in their daily lives. The items were originally adapted from an inventory of ecological behaviours that Greenpeace Australia listed as desirable in 2003 (Casey & Scott, 2006). Additionally, the behaviours that were included in the scale were only those that were deemed to be easily performable by the majority of people, every day, for example, ‘when I buy a few items at the store I say no to plastic bags’. Participants responded to the items by indicating how much they performed a behaviour (if at all) on a 4-point Likert type scale (0= 
None to 4 = Always). The PEB showed a high reliability in Casey and Scott’s study, with an alpha coefficient of .81. The reliability of the PEB in the present study was even higher, with an alpha coefficient of .87. The PEB is attached as Appendix G.

2.3 Procedure

Participation was voluntary and anonymous with the questionnaire being completed online at the participant's discretion. The participants were supplied with the contact details of the experimenters for questions they may have, the research ethics committee for complaints and counselling services for any potential issues raised. Once informed consent was obtained (Appendix B) the questionnaire commenced. Due to limitations of the ‘OPINIO’ program, there was no counterbalancing between measures. However, as the environmental knowledge scale was considered sensitive to fatigue, it was completed early on in the questionnaire. That is, unlike the measures of epistemic style, trust in environmental scientists and pro-environmental behaviour which all measure relatively stable concepts, the environmental knowledge scale was a test and as such performance on it can be affected by the participants mental state.
Chapter 3: Results

Pearson correlation coefficients between all variables contained in the proposed model are shown in Table 2. As shown, IP and DP were highly negatively correlated. Thus the more of a preference one had for the IP, the less of a preference they had for the DP. As expected, the variables of system, action-related and effectiveness knowledge were significantly and positively related to IP, and significantly and negatively related to DP. This meant that people who had a preference for the IP had higher amounts of environmental knowledge than those who had a preference for the DP, who had lower amounts of environmental knowledge. In addition, the three knowledge variables were all significantly and positively related to each other, lending weight to the present study’s employment of them as predictors of the latent variable environmental knowledge.

The results in Table 2 also revealed benevolence to have a significant positive correlation with IP and a significant negative correlation with DP, whilst self-interest yielded a significant negative correlation with DP only. This meant that people who were more inclined to use an IP epistemic thinking style were more likely to also believe that environmental scientists were benevolent, whilst people who were likely to adopt a DP epistemic thinking style were more likely to think that environmental scientists were motivated by self-interested goals.
Table 2

*Pearson’s Correlation Coefficients, Means and Standard Deviation for all Variables used in the Current Study*

<table>
<thead>
<tr>
<th>IP</th>
<th>DP</th>
<th>System Knowledge</th>
<th>Action-Related Knowledge</th>
<th>Effectiveness Knowledge</th>
<th>Competence</th>
<th>Benevolence</th>
<th>Self-Interest</th>
<th>Environmental Behaviour</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DP</td>
<td>-.74**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>System Knowledge</td>
<td>.29**</td>
<td>-.36**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Action-Related Knowledge</td>
<td>.22**</td>
<td>-.35**</td>
<td>.46**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effectiveness Knowledge</td>
<td>.17*</td>
<td>-.19**</td>
<td>.24**</td>
<td>.19*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Competence</td>
<td>.90</td>
<td>-.12</td>
<td>.02</td>
<td>.19*</td>
<td>-.04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benevolence</td>
<td>.19*</td>
<td>-.18*</td>
<td>.14</td>
<td>.27**</td>
<td>-.03</td>
<td>.76**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-Interest</td>
<td>-.14</td>
<td>-.24**</td>
<td>-.28**</td>
<td>-.26**</td>
<td>-.23**</td>
<td>-.12</td>
<td>-.16</td>
<td></td>
</tr>
<tr>
<td>Environmental Behaviour</td>
<td>.38**</td>
<td>-.31**</td>
<td>.33**</td>
<td>.23**</td>
<td>.05</td>
<td>.28**</td>
<td>.41**</td>
<td>-.22**</td>
</tr>
</tbody>
</table>

SD .62  .69  3.02  2.54  1.82  4.18  4.7  4.71  .51

*Note: ** = Correlation is significant at the 0.01, * = Correlation is significant at the 0.05, IP refers to Intellective Position, DP refers to Default Position*
Additionally, there was a strong significant positive correlation between competence and benevolence, whilst both were unrelated to self-interest. This suggests that self-interest may not be contributing to the latent variable of trust.

Finally, as expected, environmental behaviour was significantly and positively correlated with all of the variables except DP and self-interest, which were significantly and negatively correlated to environmental behaviour. Thus, people who were high on DP and believed environmental scientists to be self-interested engaged in less pro-environmental behaviour. In contrast, participants who scored high on the variables of IP, system, action-related and effectiveness knowledge, as well as competence and benevolence, scored higher on the environmental behaviours scale, than participants who scored low on those variables.

3.1 Model testing

The theoretical model shown in Figure 2 (see page 21 for the model) was tested using structural equation modelling (SEM) via EQS for Windows Version 6 (Bentler, 2001). Because the correlation of IP and DP was extremely high (r = -.74) it was decided to use one latent variable to indicate the concept of epistemic style. In other words, it was decided to combine the two variables
to represent opposite poles of the same dimension named ‘epistemic style’ (see Figure 3). The three perceived motivation scores were used to represent a latent variable “trust in environmental scientists”, and the three knowledge subscales were used to indicate an overall “knowledge of environmental issues”.

Environmental behaviour was conceptualised by the measured total score from the PEB. The results showed that the theoretical model proposed in Figure 1 was not a good fit with the data. While the Comparative Fit Index (CFI; Bentler, 1990) and Bollen’s Incremental Fit Index (IFI; Bentler, 1990) were both above .90 (CFI= .93, IFI= .93) indicating a good fitting model with the data, the Root Mean-Square Error of Approximation (RMSEA) was equal to .09, which should be below .07 according to Hancock and Freeman (2001). The chi-square ($\chi^2$) goodness of fit value for the model was $\chi^2$ (24) =51.78, p<.01. The modification indices suggested that two additional meaningful correlations would reduce the $\chi^2$ value by 24.59. Specifically, the Lagrange Multiplier test (LM test, Lee & Bentler, 1980) suggested that there should be a correlation included between knowledge and self-interest, and that there should be a direct effect from IP to environmental behaviour.
Figure 3. Modified model for epistemic style’s influence on environmental behaviour

Note: N = 149, ***=p<.001, **=p<.01, *=p<.05, ns=not significant at p<.05, IP refers to Intellective Position, DP refers to Default Position
Theoretically, knowledge may be related to believing that environmental scientists are self-interested, because the fact that they have low knowledge could be due to their low trust in environmental scientists. In addition, it is reasonable to assume that environmental knowledge does not mediate the total variance that IP may contribute to environmental behaviours, as IP could act through many other psycho-social variables to impact upon environmental behaviours. Thus in this research it is quite reasonable to expect a direct effect from IP to environmental behaviour. Therefore, it was decided to include these additions and rerun the model to test whether this modified model would improve the fit with the data.

The modified model (Figure 3) contained 38 parameters and 149 cases, resulting in a parameter to case ratio of 1:4 which is slightly lower than the 1:5 ratio suggested by (Byrne, 2001). The distribution of scores was not significantly skewed. Mardia’s Multivariate Kurtosis Normalised Estimate was 2.88, which was below the critical value of 3.29 (Mardia, 1974). The results suggested one multivariate outlier, however the case was retained as analyses including the outlier resulted in only a few parameters changing minimally (the maximum change being no more than .03). The results of this modified model are presented in Figure 3.
The modified model was found to be a very good fit with the data, $\chi^2(22) = 33.134, p = .06$; CFI = .97, IFI = .97; RMSEA = .06 with a 90% confidence interval that .07 would be between .00 and .10. The parameter estimates show that epistemic style had a significant, direct effect on knowledge, predicting 24% (i.e., .49 x .49) of the variance in environmental knowledge. This path was positive, indicating that higher scores on epistemic style (indicative of a preference for the IP) would predict greater knowledge, and conversely that lower scores on epistemic style (indicative of a preference for the DP) would predict a lower amount of environmental knowledge. The path leading from environmental knowledge to environmental behaviour showed that knowledge significantly predicted 5% (i.e., .23 x .23) of the variance in environmental behaviour. This means that people who have higher environmental knowledge tended to perform more pro-environmental behaviours. Epistemic style thus had an indirect effect on environmental behaviour ($p < .001$), with environmental knowledge mediating the relationship between the two variables. Specifically, the strength of the indirect effect of epistemic style to environmental behaviour was .11, which meant that epistemic style explained roughly 0.5% of the variance found in environmental behaviour through environmental knowledge. Additionally, the IP variable directly predicted 6% (i.e., .24 x .24) ($p < .01$) of
environmental behaviour, indicating that a preference for the IP is predictive of greater amounts of pro-environmental behaviours.

Unexpectedly, there was no significant path between epistemic style and trust in environmental scientists. Thus, trust in environmental scientists did not mediate the relationship between epistemic style and environmental behaviour. Nevertheless, trust in environmental scientists did significantly and positively predict environmental behaviour. This result indicated that people who have high amounts of trust in environmental scientists tend to perform more pro-environmental behaviours than their counterparts. Additionally, there was a significant negative correlation between environmental knowledge and self-interest. This indicated that people who have high amounts of environmental knowledge tend to perceive environmental scientists to be less self-interested than their counterparts.
Chapter 4: Discussion

The present study was the first empirical attempt to test people’s preference of epistemic style and its effects on their knowledge and trust in predicting their environmental behaviour. The proposition that epistemic style could be used as a measure of individual difference that can in part determine an individual’s eventual behaviour was partially supported by the results of the study. Specifically, the hypothesis that IP would positively predict environmental knowledge, which would in turn predict pro-environmental behaviour, with environmental knowledge mediating the relationship between an individuals’ epistemic style and their pro-environmental behaviour was supported. However, contrary to expectations, the hypothesis that DP would positively predict trust in environmental scientists, which would in turn predict their pro-environmental behaviour was not supported. There was no significant relationship between epistemic style and trust. In addition, the hypothesis that people with a preference for the IP epistemic thinking style would tend to employ trust in environmental scientists due to their environmental knowledge in helping inform their decision making was also not supported. Thus, trust in
environmental scientists was not shown to mediate the relationship between epistemic style and pro-environmental behaviour.

Furthermore, the original model was significantly improved by the inclusion of a direct effect between IP and environmental behaviour. This meant that a preference for logical/rational problem-solving and decision making strategies directly predicted higher amounts of pro-environmental behaviours. A correlation between environmental knowledge and self-interest was also included which showed that perceiving environmental scientists as motivated by money and personal reward was associated with having lower environmental knowledge.

Notably, the variables of IP and DP were so highly negatively correlated with each other that their scores were combined to represent two opposite poles of a latent variable named epistemic style. Higher scores on epistemic style indicated a preference for the IP and lower scores indicated a preference for the DP.

Each hypothesis has been discussed below in more detail, followed by a consideration of the limitations of the present study, suggestions for future research and finally a discussion of the overall implications of the results.
4.1 Epistemic style, knowledge and environmental behaviour

Results of the current study supported the hypothesis that IP would positively predict environmental knowledge, which will in turn predict pro-environmental behaviour. Participants who had higher scores for the IP tended to have high scores on environmental knowledge. Specifically, IP predicted roughly 27% of the variance in environmental knowledge. The hypothesis that DP will negatively predict environmental knowledge was also supported, with people who had a preference for the DP tending to receive lower scores on environmental knowledge than their counterparts. Furthermore, participants with higher amounts of environmental knowledge also tended to carry out greater amounts of pro-environmental behaviours than those participants with lower environmental knowledge. As such, the assumption that those people who have a preference for the IP will have higher knowledge about the environment than people who have a preference for the DP, and consequently perform more pro-environmental behaviours, was upheld. Thus, environmental knowledge partially mediated the relationship between individuals’ epistemic style and their pro-environmental behaviour. This means that a person’s epistemic style impacted upon their amount of pro-environmental behaviours through its influence on their environmental knowledge.
These results support the idea of Barkman and Bögeholz (1999), who contended that higher-order cognitive skills play a key role in the employment of environmental knowledge to inform behaviour. Specifically, the current results indicated that people who were more likely to employ higher-order cognitive skills were found to have higher levels of environmental knowledge which in turn predicted greater amounts of pro-environmental behaviour.

Additionally, the results showing environmental knowledge directly predicting pro-environmental behaviour are in line with research conducted by Frick et al. (2004) who found that environmental knowledge was a significant predictor of pro-environmental behaviour. The present study’s results strongly support previous environmental knowledge/behaviour research in that environmental knowledge was found to predict just over 5% of the environmental behaviours measured, almost identical to the results of Frick et al. and others (e.g., Hines, et al., 1986; Langeheine & Lehmann, cited in Schahn & Holzer, 1990) who found environmental knowledge to predict roughly 4% to 6% of environmental behaviour. These results lend weight to Bamberg and Moser’s (2007) assertion that environmental knowledge is one of many predictors of environmental behaviour, and as such only explains a small share of the variance found in environmental behaviour, as its main effect on
behaviour is through its influence on the other psycho-social variables depicted in Figure 1.

4.2 The intellective position (IP) and environmental behaviour

Due to a significant direct effect being included to improve the fit of the overall model, IP was found to predict environmental behaviour, independent of its influence through environmental knowledge. That is, IP directly predicted nearly 6% of the environmental behaviour measured in the present study with higher amounts of IP being indicative of higher amounts of environmental behaviours. The extent to which IP predicted environmental behaviour in the present study is interesting, as it explained slightly more variance in behaviour than environmental knowledge.

Theoretically, the link between IP and environmental behaviour makes sense, as having a preference for the IP means that an individual has a preference for elaborated forms of thinking and judgement (Eigenberger et al., 2007). A person who has a preference to tackling problematic situations through the IP would tend to employ critical thinking and logical/rational strategies to decide on their actions. As such, it is reasonable to postulate that someone who thinks logically is likely to perform pro-environmental
behaviours, just because they exercise rational thought, even if they do not have any specific environmental knowledge. This is because some pro-environmental behaviour is rational, with conservation being one such activity. For example, re-using a plastic bottle is logical because the person would not have to buy another one - it is a logical behaviour because it saves the person money and costs them nothing to re-use it, and as a by-product of that logical reasoning, an environmental behaviour is performed.

Additionally, it is likely that the relationship between the IP and environmental behaviour is mediated by other psycho-social variables not examined in this study, such as those in Bamberg and Moser’s (2007) study, which included the TPB variables of attitudes, PBC and intention. As mentioned, the TPB is based on a rational-choice representation of human beings where decision making is directed by a rational assessment of behavioural consequences (Bamberg & Moser, 2007). As individuals who have a preference for the IP generally take a more rational/logical stance when deciding upon a decision, it is postulated that their process of decision making would tend to follow the TPB approach (Ajzen, 1991). For example, participants with a preference for the IP may have an inclination to sum the perceived positive and negative consequences of a certain behaviour. For
example, when deciding whether to quite smoking, a person might weigh the positives (for example, improvements in their health) versus the negatives (for example, discomfort of withdrawal). This process could influence their global attitude towards the behavioural option - that quitting is a good idea because being healthy in the long run is better than short term withdrawal symptoms. A logical self-assessment could then inform their PBC that they have the perseverance and social support to quit and thus combined with their attitude towards the option could determine their behavioural intent, and ultimately their actual behaviour - attempting to quit smoking. Testing this model of epistemic style within a TPB framework could shed more light on the effects of an individual’s epistemic preference on their eventual behaviour, and as such is suggested as a useful avenue for future research.

Epistemic style could also be linked to the variable of problem awareness from the NAM section of Bamberg and Moser’s (2007) model. This is because environmental knowledge encompasses the concept of problem awareness and the present study has shown that having a preference towards the IP is predictive of higher environmental knowledge and having a preference for the DP is predictive of lower environmental knowledge.
4.3 Epistemic style, trust in environmental scientists and behaviour

Contrary to the hypothesis, having a preference for the DP epistemic thinking style did not significantly predict trust in environmental scientists. Results suggested that epistemic style was not an individual difference variable that was able to identify individuals who were likely to use trust in environmental scientists to inform their environmental behaviour. This finding is contrary to informational influence theory which emphasises that individuals who are lacking in the necessary information to come to a decision or decide between certain behaviours would put their trust in perceived knowledgeable others to help inform their actions (Cialdini & Goldstein, 2004; Critchley, In Press). This finding does not conclusively indicate whether or not epistemic style can be used as a predictor of those people who are more likely to be swayed by social influence. Rather, it only implies that having a preference for the IP or the DP is not predictive of people’s trust in environmental scientists. Therefore, the pattern of results in the present study cannot be generalized to trust in other types of experts.

Interestingly, having low environmental knowledge was correlated with perceiving environmental scientists as self interested, which according to trust research is indicative of distrust (Siegrist, 2000). These findings are
incongruent with previous research, as informational influence and trust theory cannot explain why people with low knowledge on an issue do not trust those who are often expected to have more knowledge than most on the current environmental situation. The incongruence between the present study’s results and informational influence theory lies in the premise that people who lack information on an issue that is ambiguous, trust and follow the actions of experts. That is, one explanation is that epistemic style does not predict trust in environmental scientists. However, an alternative explanation is that they put more trust in other experts which were not measured in the current study. As such, the findings of the present research may not provide adequate evidence to counter the argument made by informational influence theory.

In the present study, it was proposed that the current problematic environmental situation represented one such ambiguous crisis, and that environmental scientists were the experts on the issue. Perhaps the respondents in this research may not have perceived environmental scientists as being the ‘experts’ on the current environmental crisis. For example, there could be an opposing view by the national governing body, which influences their pro-environmental behaviour. That is, if environmental scientist’s promote cutting down on carbon-dioxide emissions to prevent global warming, while the
democratically elected prime minister suggests that there is no such thing as global warming, people may put more trust into the prime minister who they believe to be the overarching expert on the issues that effect their lives, in order to inform their environmental behaviours (or lack thereof). It may therefore be prudent to also include a measure of trust in governing bodies in future research to determine whether trust does indeed play a role in the mediation of epistemic style’s prediction of behaviour.

Furthermore, the hypothesis that people with a preference for the IP would employ trust in environmental scientists as well as information from various other sources to inform their decisions about which behaviours to perform was not supported. This was because high environmental knowledge did not significantly predict trust in environmental scientists. However the result of lower knowledge being associated with higher perceived self-interest in environmental scientists provides partial support for this line of reasoning, as people who have a preference for the DP epistemic thinking style tended to have lower environmental knowledge in the present study. Thus, whilst having higher environmental knowledge (people with a preference for the IP) did not predict trust in environmental scientists as hypothesised, it was also not associated with perceiving environmental scientists as self-interested, while
people with lower environmental knowledge were (people with a preference for
the DP). This finding also provides partial support for Nisbet’s (2005) claim
that better understanding of an issue translates into increased public support for
the experts, with the present results indicating that a lower understanding of an
issue is associated with decreased trust for the experts in that field.

A possible reason why differences in epistemic style did not predict
trust in environmental scientists is that both people who have a preference for
the IP and people who have a preference for the DP may have similar levels of
trust in environmental scientists. Informational influence and social trust may
be the mechanisms through which people who prefer the DP come to trust and
follow environmental scientists. Correspondingly, perhaps people who prefer
the IP trust environmental scientists because they recognise the complexity of
the environmental problems and as such put their faith in the people who they
assume have spent much more time and effort than the lay person in
researching the issues involved. Therefore, one may expect that both people
high in the IP and the DP may display similar levels of trust in environmental
scientists, resulting in a very weak or non-existent relationship between
epistemic style and trust in environmental scientists.
Finally, as expected, trust in environmental scientists predicted higher amounts of pro-environmental behaviour. Specifically, trust in environmental scientists predicted over 10% of the variance found in environmental behaviour for this sample. This finding supports social influence and trust theory in that participants used the behaviours or information from knowledgeable others (environmental scientists) as a frame of reference of the possible environmental behaviours they could perform and consequently adopted them.

4.4 Limitations of the present study

4.4.1 Measures

There were two main limitations of the measures used in this study, one of which affected the EKQ and the other the TESQ. Firstly, effectiveness knowledge did not significantly contribute to the latent variable of environmental knowledge, even though in Frick et al.’s (2004) study it was shown to be a significant indicator, along with system knowledge and action-related knowledge. This was not ideal and can be explained by effectiveness knowledge not being adequately represented in the sample. Specifically, the mean effectiveness knowledge score for this sample was very low (8.60 out of a possible 19), with observed scores ranging from five to 13. This indicates that
the range of effectiveness knowledge was restricted, which means that there may not have been enough distinction between high and low scores on the variable. This can be compared to system knowledge’s mean of 16.23 (observed range = seven to 23) and action-related knowledge’s mean of 12.90 (observed range = six to 19), both of which were out of a total of 25. This pattern of results is similar to those in Frick et al.’s study, with the exception being the insignificant factor loading for effectiveness knowledge. In Frick et al.’s study, the factor loading of effectiveness knowledge was also very weak, yet it was still a significant predictor of pro-environmental behaviours. Because it was so weak, Frick et al. contended that the influence of effectiveness knowledge on pro-environmental behaviour was questionable, however because all three variables were positive predictors of environmental knowledge the overall measure was deemed to still be valuable to environmental knowledge research. As such, this limitation was only of minor consequence to the present study.

Secondly, and more seriously, the variable of self-interest was not a significant indicator of trust in environmental scientists. This calls into question the theoretical significance of self-interest as an indicator of trust. As expected, benevolence and competence were strong and significant positive indicators of
trust in environmental scientists; however the value of using this measure in the current study was reduced by only two out of three purported indicators of trust being significant. Indeed, whether or not the variable of self-interest should be included as an indicator in measures of trust is a matter of some controversy. Self-interest was first introduced as an indicator of trust because it was theorised to signify the opposite of what the construct of benevolence represents (Omodei & McLennan, 2000) and there is some evidence to support this claim. However, other researchers (e.g., Critchley, In Press) have found self-interest to be only slightly related to trust. As such, the structure of the construct of trust for the purposes of the present study is still relatively unclear. Accordingly, the present study was unable to adequately test the hypothesis that differences in epistemic style would predict levels of trust and the route through which people trust environmental scientists.

4.4.2 Design

Limitations of the design aspects of the present study include the rationale for measuring everyday easily accessible environmental behaviours as well as issues with sampling adequacy. The PEB Scale’s items were included only if they were those behaviours that were deemed to be easily performable
by the majority of people, every day. It was considered important to test people’s ecologically friendly behaviours at the simplest level (i.e., do you recycle your newspapers?) in order to ensure a normal distribution of results. Furthermore, examination of the most accessible environmental behaviours was performed to provide a baseline for future research on epistemic style and knowledge. That is, if people do not perform the most undemanding of pro-environmental acts, it is unlikely that the same people would engage in more strenuous and personally demanding actions in the environments assistance and recovery. However, the findings of the present study are therefore limited in that the percentage of environmental behaviours predicted by epistemic style, knowledge and trust are not representative of the entirety of feasible environmental behaviours. Perhaps with the inclusion of items that were less accessible to everyday action (for example, have you or would you invest in green companies over an environmentally destructive company if the monetary rewards would be less?), a different pattern of results may have emerged that was more characteristic of the real world.

In retrospect, it was also a limitation of the present study that participants were not asked if they perceived environmental scientists to be knowledgeable on the current environmental crisis. It was wrongly assumed that participants
would perceive environmental scientists to be expert on the current environmental crisis, and this limitation could possibly have been overlooked if the pathway between DP and trust in environmental scientists was significant. If such a check had been performed and it was found that participants in general did not perceive environmental scientists to be the experts on the current environmental crisis, then it could be proposed that this was the explanation for the insignificant link between epistemic style and trust in environmental scientists. That is, the wrong experts may have been examined. Alternatively, if such a check showed that participants did perceive environmental scientists to be experts on the current environmental crisis, then the present study’s results could have provided much stronger evidence for the interpretation that trust in experts does not mediate the relationship between epistemic style and environmental behaviour. This limitation to the present research means that the incongruence between this study’s results and informational influence theory is not a conclusive argument against informational influence theory.

There was also a sample size limitation present in the modified model (see Figure 4) as it comprised 38 parameters and 149 participants, which resulted in a parameter to case ratio of 1:4 which is slightly lower than the 1:5 ratio suggested by Byrne (2001). Tabachnick and Fidell (2007) explain that
SEM is based on covariances, and that parameter estimates as well as chi-square tests of fit are very sensitive to sample size. Consequently, SEM is defined as a ‘large sample’ technique, signifying that larger sample sizes allow for testing of stronger power calculations. This limitation may have therefore reduced the reliability of the results obtained.

Finally, the sample employed was not a representative sample of any particular population. This was partly because the sampling technique employed was not entirely random, with the initial emails inviting people to participate being sent out to people on the author’s personal email contact list. The people were asked if they would be kind enough to forward the email onto their own personal contact lists, thus creating a snowball effect. The questionnaire was also only available to be completed online, therefore the sample was limited to people who had access to the internet. The sample was also relatively small, well educated and there were slightly more men than women. All taken together, these limitations restrict the generalisability of the present study’s results, and future research should attempt to obtain a more representative sample in order to elucidate truly meaningful, real-world applicable results.
4.5 Implications of the study and suggestions for future research

The implications of the present study’s results if supported by future, more extensive research are far reaching, with connotations for environmental knowledge/behaviour theory as well as broader implications for education and human environmental (as well as social) responsibility. Firstly, the present study provided support for the hypothesis that epistemic style predicts high environmental knowledge for those people who have a preference for the IP and low knowledge for those people who have a preference for the DP, with knowledge in turn positively predicting pro-environmental behaviour. As such, an implication for future research might include a rethink of environmental knowledge’s place, as well as that of an individual’s epistemic style, into the hierarchy of psycho-social predictors of pro-environmental behaviour. If epistemic style was to be included in a study like Bamberg and Moser’s (2007), it is expected it would be placed at the beginning of the process, being a foundation in predicting other psycho-social variables that in turn predict behaviour. Therefore, future research should attempt to look at the place of epistemic style in the Ajzen’s (1991) TPB theory as previously mentioned, as well as look at its positioning in the broader context of environmental
behaviour prediction research, within Bamberg and Moser’s combined NAM and TPB framework.

The results of this study point to the need to design strategies that will target people who have a preference for the DP to increase their pro-environmental behaviours with campaigns that rely on strategies other than simply increasing people’s knowledge. This would entail strategies that focus on ‘peripheral cues’ (for example, a physically attractive source), or heuristics (for example, “mum’s always right”) to guide judgement in much the same way that research on the elaboration likelihood model suggests (for review see Crano & Prislin, 2006). The elaboration likelihood model of attitude change has long suggested that those with a low need for cognition are more likely to change their attitude in response to these types of peripheral cues (Petty & Cacioppo, 1986).

The implications, if supported by future research, for education in Australia as well as internationally are significant. Put simply, these results point towards having a preference for the intellectual position of epistemic style as important in the implementation of knowledge in our decision making and actions. Thus, it is implied by the results that people who have a preference for the DP may not learn as well as people who have a preference for the IP.
Hence, if education is the impartation of knowledge to students, then it is vital that students have a preference for the IP over that of the DP to be able to attend to the knowledge they learn through education. Furthermore, in order to encourage greater pro-environmental behaviour in the community, it may be prudent to develop a culture which fosters the IP over the DP.

The present study’s results may additionally have repercussions for social responsibleness in general, as well as for environmental behaviour. If the IP epistemic thinking style is in future firmly established to be positively linked with greater knowledge and greater pro-social actions, then it would be prudent to attempt to create a preference for the IP epistemic thinking style in the general community for the benefit of all. This would suggest that changing people’s epistemic preference towards that of the IP would be beneficial. Consequently, further research could look into studying if it is possible to shift adults who have a preference for the DP into having a more a philosophical outlook. Perhaps implementing education in critical thinking strategies to swing from a preference for the DP to a preference for the IP could be beneficial, as education research suggests that people can be taught critical thinking skills (for a review, see Pithers, 2000). Future research could also look for the best ways to introduce the IP thinking style to children within their formative years to
provide them with skills in higher-order cognitive thought that will benefit themselves and others for the rest of their lives.

4.6 Conclusion

In conclusion, the hypothesis that examined the relationship between epistemic style, social influence and trust, and environmental behaviour was not assessed to a satisfactory standard. This is due to the methodological limitation of the TESQ, in conjunction with the lack of distinction found in the current sample in the amount of trust towards environmental scientists between the IP and the DP epistemic styles, As such, implications could not be drawn, other than to suggest that the measurement of trust, and specifically the inclusion of self-interest as an indicator of trust, should be looked at more closely in future to allow hypothesis testing which would further validate this construct.

In contrast, the hypothesis that explored the relationship between epistemic style, environmental knowledge and environmental behaviour elucidated meaningful and interesting results that have the potential to stimulate much more research into the impacts of an individual’s epistemic style on their use of knowledge, and their pro-social responsibility. Specifically, the present research provided evidence that strategy to increase pro-environmental
behaviour should not just focus on increasing knowledge campaigns, as these campaigns may be relatively unsuccessful for people who have a preference for the DP. Therefore recommendations include targeting people who have a preference for the DP using pro-environmental campaigns which employ peripheral cues to persuasion. Furthermore, suggestions for education include fostering a culture of IP, so as to increase the effectiveness of the transference of knowledge. In general, finding a fundamental individual difference that is predictive of pro-environmental behaviour such as epistemic style is exciting in its possible implications for future social responsibility research, which may one day improve democratic participation and ultimately help humanity to achieve a higher level of social consciousness.
Chapter 5: References


Critchley, C.R. (in press). Public opinion and trust in scientists: The role of the research context, and the perceived motivation of stem cell researchers. *SAGE Publications*


Hello ☺

My name is Matthew Farrugia and I am currently completing honours in psychology at Swinburne University. I have finally received the go ahead to start conducting my honours thesis research which has been 6 months in the making (phew- now the hard part, collecting data..). Its worthy research looking at the reasons why there are so many problems in the world (war, global warming, poverty, hunger etc) in a time when we have had such massive technological advances and increases in material wealth.

Please follow the link below to respond to the survey:
http://opinio.online.swin.edu.au/s?s=2145

Your participation will be greatly appreciated, and if you could forward this on to anybody who you think would like to contribute to this cause, please do.

Thank you very very much,

Sincerely,

Matthew Farrugia
Appendix B

Information Sheet and Consent

Dear Participant,

Thank you for taking the time to participate in this survey. My name is Matthew Farrugia and I am currently completing Honours in Psychology under the supervision of Dr. Christine Critchley at Swinburne University. I am interested in investigating the relationship between people’s initial thought processes, their knowledge, their trust and their behaviours.

The survey will ask you some general questions about yourself followed by questions regarding the way you prefer to problem-solve and make decisions. You will be then asked a number of multiple choice environmental questions where you are only required to give your best response. The survey will take approximately thirty minutes to complete and the results of the study could eventually be published in a scientific journal.

If you choose to participate, any information you provide will be anonymous and only the researchers will have access to the data sheets. Strict confidence will be upheld to ensure that all participants cannot be identified in any material presented to any other sources.

By completing this questionnaire, you're expressing your consent to participate in this study and in doing so your anonymity is assured. You are free to withdraw from the completion of this questionnaire at any time.

Thank you very much for your participation. We value your response to this survey and hope that this research may further our knowledge regarding the links between people’s various styles of thought and the ways in which these shape the way people act in our world.

If you have any questions, please feel free to ask at any stage using the contact details provided below.

Mr Matthew Farrugia: 0412 616 776

Or alternatively,

Dr. Christine Critchley, at the faculty of life and social sciences, Swinburne University, Hawthorn via Email: ccritchley@swin.edu.au

If you have any concerns or complaints about the conduct of this project, you can contact:

Research Ethics Officer
Office of Research and Graduate Studies (H68)
Swinburne University of Technology
P O BOX 218, Hawthorn VIC 3122
Tel: (03) 9214 5218
Email: resethics@swin.edu.au

If you feel any concern or personal distress as a result of completing this questionnaire you can discuss the matters with either the Chief Investigator or the student counselling service - Hawthorn: 9214 8882; Lilydale: 9215 7123
Appendix C

Demographic Information

The following questions are needed in order to obtain some information about you. Please answer the questions by filling in the blanks or ticking the box that best represents your situation.

1. What is your age in years:
   Under 20 □  20 – 24 □  25 - 29 □  30 - 39 □
   40 - 49 □  50 – 59 □  60 - 69 □  70 and over □

2. What is your gender?
   Male □  Female □

3. Are you an Australian citizen?  Yes □  No □

4. What country were you born in?
   _________________________________

5. What country have you lived the longest in?
   _________________________________

6. What is your highest level of education achieved or finished so far?
   □ Primary
   □ Some secondary
   □ Completed secondary
   □ Trade Qualification
   □ TAFE or Diploma level
   □ Incomplete Tertiary
   □ Complete Tertiary
   □ Postgraduate
7. Are you currently studying?  
   Yes □  No □
   If ‘Yes’ what is your major area of study?
   □ Business
   □ Science
   □ Social science
   □ Engineering
   □ Arts (such as history and philosophy)
   □ Visual arts and media
   □ Other (Please specify)

8. How would you classify your employment status?
   □ Full time
   □ Part time
   □ Casual
   □ Self employed
   □ Unemployed

9. What would you rate your awareness of current environmental issues?
   0% 10 20 30 40 50 60 70 80 90 100
   (none at all) (very high)
Appendix D

Epistemic Preference Indicator (EPI)

The items below are organized in pairs and have to do with your preferred ways of dealing with certain questions, problems, or issues. Compare the ‘a’ and ‘b’ options, then indicate the degree to which each statement reflects the way you generally believe, feel, or act. Respond to both options using the following scale:

Blacken the bubble in column 1 if you completely disagree with the statement
2 if you mostly disagree with the statement
3 if you are in between
4 if you mostly agree with the statement
5 if you completely agree with the statement

--- PLEASE CONSIDER BOTH ‘a’ AND ‘b’ STATEMENTS BEFORE RESPONDING ---

1. IN MOST LEARNING SITUATIONS I LIKE IT BETTER IF:
   Disagree….Agree
   a) topics are concrete and provide information that is obvious and useful…
   b) topics involve theories and open questions that have no sure answers

2. I PREFER TO INVEST MY TIME IN:
   Disagree….Agree
   a) finding explanations for historical, natural, or human conditions…
   b) getting just the right information to solve my practical problems

3. I GENERALLY CONSIDER MYSELF TO BE MORE:
   Disagree….Agree
   a) philosophical – evaluating many diverse ideas…
   b) practical – finding the answer that works for me right now

4. THE MOST VALUABLE FOR THE SURVIVAL OF SOCIETY IS:
   Disagree….Agree
   a) using philosophy and science to question our beliefs…
   b) standing firm on our core beliefs and values

5. WHEN IT COMES TO DECIDING WHAT TO BELIEVE, I USUALLY:
   Disagree….Agree
   a) stick to the basics – the ‘tried and true’…
   b) experiment with different theories and beliefs

6. WHEN CONFRONTING THE PHILOSOPHICAL ISSUES OF LIFE I AM MORE INCLINED TO:
   Disagree….Agree
   a) go into them deeply, constantly looking at different explanations…
   b) just deal with it, get the job done and move on

7. TO BE PERFECTLY HONEST:
   Disagree….Agree
   a) I have very little interest in subjects like philosophy or world history…
   b) I have a strong need to understand the past and the ideas people had

8. TRUE KNOWLEDGE:
   Disagree….Agree
   a) is basically impossible – nothing is really the way you think it is …
   b) is completely possible – just open your eyes and ears

--- Sample Question: ---
I AM MORE INCLINED TO:  
a) buy on impulse…  
b) conduct product research
9. IT IS BETTER TO BE:

   a) a solid, true believer with a firm set of values…  Disagree… Agree
   b) a critical thinker who doubts everything until it’s been tested and verified

10. I MOSTLY HAVE A NEED FOR:

   a) a no-nonsense, bottom-line approach to life, where I can get definite answers to my questions…  Disagree… Agree
   b) exploring theoretical and novel questions – even if there are no definite answers

11. WHICH QUOTE DO YOU IDENTIFY WITH THE MOST?

   a) "The unexamined life is not worth living"  Disagree… Agree
   b) "Just do it"

12. IN DISCUSSIONS:

   a) I become impatient when people turn simple questions of right and wrong into complicated ethical issues…  Disagree… Agree
   b) I enjoy exploring the ethical and philosophic problems I find in the world around me

13. VERY OFTEN:

   a) I get tired of hearing scientific or theoretical explanations for everything in the world…  Disagree… Agree
   b) I try to find a variety of theoretical explanations for events and things in the world

14. IN THE SIMPLEST TERMS:

   a) I don’t need a deep explanation for why a lot of things happen…  Disagree… Agree
   b) I have a strong need to study just how and why things happen

15. IN GENERAL:

   a) I am most satisfied when I am working on a challenging intellectual issue…  Disagree… Agree
   b) I am more satisfied by other activities, or just relaxing

16. WHEN IT COMES TO DEVELOPING A PHILOSOPHY OF LIFE I HAVE ALWAYS:

   a) done alright with just the basic guidance I received when I was young…  Disagree… Agree
   b) tried to consider a wide range of different ideologies

17. IF GIVEN A CHOICE I PREFER TO:

   a) deal with smaller, concrete projects that have immediate results…  Disagree… Agree
   b) deal with global, conceptual projects with uncertain outcomes

18. WHEN IT COMES TO READING, STUDYING AND OTHER ACADEMIC WORK:

   a) I like to finish it up quickly and move on to other kinds of things…  Disagree… Agree
   b) I tend to become immersed, following a number of related thoughts
In this part of the survey, we are interested in your environmental knowledge. The questionnaire is separated into three parts reflecting your understanding of environmental systems, your knowledge of behavioural options and possible courses of pro-environmental actions, and your knowledge regarding the relative gain or benefits of environmental actions.

Remember that this study is completely anonymous. If you are unsure of an answer please have a guess - do not use any additional references.

Please mark your answer by filling in the appropriate box.

*For the following questions, one answer is correct:*

1. **On clear nights, why does it get colder towards the morning?**
   - Because a clear night sky supplies more cold than a cloudy sky.
   - Because the earth radiates heat, and there is no cloud cover to retain it.
   - Because the earth absorbs the heat.

2. **Global warming also has an effect on the Gulf Stream that will affect Europe. What is this effect?**
   - The Gulf Stream will possibly lead to additional warming of the climate.
   - The Gulf Stream will possibly collapse, which will lead to a strong cooling of the climate.

3. **Which is the driest inhabited continent in the world?**
   - Africa
   - Australia
   - North America
   - South America

4. **What region is affected most by the hole in the ozone layer?**
   - The Arctic (North Pole)
   - Middle northern regions (for example, Europe)
   - Middle southern regions (for example, Australia)
   - Antarctica (South Pole)
5. If all ozone-destroying emissions were eliminated right now, how long would it take for almost complete regeneration of the ozone layer?

- 10 years
- 100 years
- 1000 years

6. What causes ocean tides?

- Ocean currents
- Transfer of energy from wind to water through friction
- Gravitational attraction between the earth and moon
- Rock formations under the waters surface

7. If the concentration of atmospheric carbon dioxide (CO2) doubled, the global mean average temperature would rise by about-

- 1 to 2°C / 1 to 3°F
- 5 to 7°C / 10 to 12°F
- More than 10°C / 18°F

For the following questions, multiple answers are possible:

8. What causes wind?

- The thrust of the clouds
- Temperature differences
- Differences in air pressure
- Ocean currents

9. Where does groundwater come from?

- It is very old and is no longer being formed
- It comes to the earth’s surface from deep geological layers
- Seepage of rainfall into the ground
- Seepage through the beds of rivers and lakes
10. Why is carbon dioxide (CO$_2$) a problem?
- Carbon dioxide damages many species of plants
- Carbon dioxide contributes to global warming
- Carbon dioxide is poisonous to many micro-organisms
- Carbon dioxide is decreasing in the atmosphere

11. Which of the following statements are true?
- Carbon dioxide (CO$_2$) forms in the process of photosynthesis
- Respiration and photosynthesis are opposite processes
- Most plants carry out photosynthesis
- Fungi (mushrooms) carry out photosynthesis

12. Which of the following kinds of energy are renewable?
- Solar energy
- Atomic and nuclear energy
- Wind power
- Fossil energy

13. Why is ozone a problem?
- Ozone in the upper atmosphere is damaging, because it reduces ultraviolet light from the sun
- Ozone damages the respiratory systems of people and animals
- Ozone reduces plant growth

14. The world population today is 6 billion. What will the world population be in the year 2025, approximately?
- 6.5 billion
- 8 billion
- 12 billion
15. According to estimates by UN experts, the earth can provide nutrition for a limited number of people. How many people?

- 7 billion
- 11 billion
- 18 billion

*True or false:*

16. The coral of the Great Barrier Reef is very resistant to external influences such as global warming.

- True
- False

17. The “El Niño” phenomenon is a direct consequence of global warming.

- True
- False

18. Clear lakes as a rule are not polluted with harmful substances.

- True
- False

19. Young children who have frequent contact with other children are more susceptible to allergies later on

- True
- False

20. One-fifth of the world’s population (1.2 billion people) lacks sufficient clean drinking water.

- True
- False

21. In principle, today there is enough food available worldwide to feed all the people on earth.

- True
- False
True or false:

1. All propellants in spray cans contribute to global warming.
   - True
   - False

2. For short drives (such as in city traffic), catalytic converters are not very effective.
   - True
   - False

3. In recycling, no energy is lost.
   - True
   - False

For the following questions, multiple answers are possible:

4. Ecologically speaking, which of the following types of water use are harmless?
   - Use of groundwater as drinking water
   - Use of lake water as drinking water
   - Use of water power to produce energy

5. How can soil erosion be prevented?
   - Maintain a blanketing layer of vegetation
   - Allow fields to lie fallow
   - Install field drainage
   - Plough regularly
   - Plant hedges for wind protection

6. To counteract global warming, it makes sense to
   - Replace oil heating systems with natural gas heating systems
   - Use public transportation instead of driving
   - Only drive cars that have catalytic converters
   - Have apartment tenants pay their own individual water bills
7. How can ozone build-up be reduced in summer time?

- Do not use solvents
- Do not drive cars
- Reduce use of electricity
- Do not use air-conditioning

8. To keep water use as low as possible, water your garden

- In the morning
- At noontime
- In the evening

For the following questions, one answer is correct:

9. Asparagus from California is environmentally harmful because

- Climatic conditions are disadvantageous for growing asparagus in California
- Too much packaging material is used
- Air transport consumes excessive amounts of energy

10. When chicken farming, to treat chickens as humanely as possible, they should be:

- Barn Laid
- Caged
- Farm Fresh
- Free Range

11. What has consumed the most energy up to the point that those Italian peppers are in the vegetable section of your grocery store?

- Heating the greenhouse
- Refrigerated storage
- Transport
- Packaging
12. How much water does it take to fill a bathtub?
- 100 litres (27 gallons)
- 200 litres (53 gallons)
- 300 litres (79 gallons)

13. What is “grey energy”?
- All the energy that an appliance uses
- All the energy to produce an appliance
- All energy consumed that is not made use of (for example, waste heat from an electric motor)
- All energy that is not taxed by the government

14. As a consequence of ploughing fields
- Soil dries up
- Soil becomes compacted
- Plants cannot absorb humus

15. If a total fire ban is issued in the summer time, you should not have an outdoor barbeque because
- The food will burn quicker
- The smoke might be confused for a dangerous fire
- There is a greater risk of accidentally starting an uncontrollable fire

16. What is the main cause of the increasing levels of nitrate pollution in groundwater?
- More cars
- Agriculture
- Industrial air pollution
- Waste water dumped in rivers
17. Why is it better to collect and recycle aluminium than to throw aluminium away?

- Because discarded aluminium gives off poisons when burned in incinerators
- Because producing new aluminium produces more poisonous materials than recycling does
- Because producing new aluminium consumes a great amount of energy

18. How many Kilojoules (kJ) does a typical office worker need per day for sufficient nourishment?

- 1250 kJ (300 kcal)
- 9650 kJ (2300 kcal)
- 15’500 kJ (3700 kcal)

True or false:

19. Nuclear power plants use far less water in energy production than natural gas plants.

- True
- False

20. In organic farming, no chemical or synthetic pesticides are used whatsoever.

- True
- False

True or false:

1. Washing your clothes in hot instead of cold water uses more electricity than leaving the refrigerator door open 24 hours a day.

- True
- False

2. Non-recyclable beer bottles are about as environmentally friendly as aluminium cans.

- True
- False
3. Incineration of waste is generally preferable to land filling of waste.

- True
- False

*For the following questions, one answer is correct:*

4. Recycling which of the following materials saves the most energy as compared to producing new material?

- Glass
- Aluminium
- Tin plate
- Paper

5. What type of milk packaging is the most damaging to the environment?

- Paperboard cartons
- Glass bottles
- Plastic bottle

6. What type of lamp consumes the least energy for the same amount of light?

- Light bulb
- Low-voltage halogen lamp
- High-voltage halogen lamp
- Fluorescent lamp

7. The energy a person can save by eating a vegetarian diet for one day is equivalent to the energy consumed by a car to travel a distance of

- 1 km (half a mile)
- 10 km (5 miles)
8. For every tonne of wood that grows (trees), how much carbon dioxide (CO₂) is removed from the atmosphere?
- 0.5 tonnes
- 1 tonne
- 1.5 tonnes
- 2 tonnes

9. A hot water faucet (tap) that leaks one drop per second for one month can use on average:
- One person’s water usage for two weeks
- One person’s water usage for four weeks

10. Meat as compared to vegetables (in amounts containing the same number of calories) is
- Twice as damaging to the environment
- Ten times as damaging to the environment

11. Energy-saving lamps consume about how much less energy than conventional light bulbs for the same amount of light?
- 20% less energy
- 50% less energy
- 80% less energy

12. How much more energy does it take to produce and transport batteries than the batteries themselves contain?
- Five times more energy
- Fifty times more energy

13. Using a pressure cooker can save about how much energy as compared to using a conventional pot?
- Up to 20% energy saved
- Up to 50% energy saved
- Up to 80% energy saved
14. To travel 1 km (1 mile), how much more energy is consumed per person by airplane as compared to by train?
   - Twice as much energy per person by airplane
   - Ten times as much energy per person by airplane

15. To travel 1 km (1 mile), how much more energy is consumed per person by car as compared to by train?
   - Twice as much energy per person by car
   - Ten times as much energy per person by car

16. How much less carbon dioxide (CO2) is emitted by cars with catalytic converters than by cars without catalytic converters in city traffic?
   - Same amount
   - 25% less
   - 10% less

17. Water-saving showerheads consume
   - One-quarter of the water consumed by conventional showerheads
   - One-half of the water consumed by conventional showerheads
   - Three-quarters of the water consumed by conventional showerheads
   
   *True or false:

18. Hydroponic production of tomatoes consumes only half the energy consumed by organic production of tomatoes.
   - True
   - False

19. It takes only half the energy to produce recycled paper than it takes to produce conventional paper.
   - True
   - False
**Appendix F**

Trust in Environmental Scientists Questionnaire (TESQ)

In this part of the survey, we are interested in what you think about scientists who are conducting research into environmental issues. In particular, we are interested in why you think people become environmental scientists, what sorts of things motivate environmental scientists and what sort of people you think they are. Below is a list of attributes and behaviours that these environmental scientists might display, please indicate how many working environmental scientists you think would demonstrate the attribute or behaviours. The options are: None, A few, Half, Many, Most or Don’t know. There are no right or wrong answers and it is not a test of your knowledge, we are simply interested in your general impressions.

<table>
<thead>
<tr>
<th>How many working environmental scientists...?</th>
<th>How many environmental scientists do you think this is true for?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Are naturally curious about their work</td>
<td>None A few Half Many Most</td>
</tr>
<tr>
<td>2. Have a natural talent for a particular area</td>
<td>None A few Half Many Most</td>
</tr>
<tr>
<td>3. Are motivated to win prizes and awards</td>
<td>None A few Half Many Most</td>
</tr>
<tr>
<td>4. Want to improve Australian society</td>
<td>None A few Half Many Most</td>
</tr>
<tr>
<td>5. Would like having media attention</td>
<td>None A few Half Many Most</td>
</tr>
<tr>
<td>6. Are honest</td>
<td>None A few Half Many Most</td>
</tr>
<tr>
<td>7. Are truly interested in finding out about things</td>
<td>None A few Half Many Most</td>
</tr>
<tr>
<td>8. Are highly trained in what they do</td>
<td>None A few Half Many Most</td>
</tr>
<tr>
<td>9. Study things primarily because it would benefit their careers</td>
<td>None A few Half Many Most</td>
</tr>
<tr>
<td>10. Want to contribute towards the understanding of our world</td>
<td>None A few Half Many Most</td>
</tr>
<tr>
<td>11. Want to be famous and well known</td>
<td>None A few Half Many Most</td>
</tr>
<tr>
<td>12. Consider the well-being of other people</td>
<td>None A few Half Many Most</td>
</tr>
<tr>
<td>13. Have a true passion for their work</td>
<td>None A few Half Many Most</td>
</tr>
<tr>
<td>14. Are motivated by money</td>
<td>None A few Half Many Most</td>
</tr>
<tr>
<td>15. Want to make life better for ordinary people</td>
<td>None A few Half Many Most</td>
</tr>
<tr>
<td>16. Enjoy being treated as important people</td>
<td>None A few Half Many Most</td>
</tr>
<tr>
<td>17. Are ethical in how they conduct their life</td>
<td>None A few Half Many Most</td>
</tr>
<tr>
<td>18. Are very intelligent</td>
<td>None A few Half Many Most</td>
</tr>
</tbody>
</table>
Appendix G

Environmental Behaviours Questionnaire

In this part of the survey, we are interested in how many pro-environmental you typically engage in. Using the scale:

- never - sometimes - often - always

please rate how frequently you perform each of the following behaviours by circling the appropriate response.

1. Where possible, I buy products made from recycled materials as opposed to those items not made from recycled materials.
- never - sometimes - often - always

2. I re-use plastic shopping bags for future shopping and/or other purposes.
- never - sometimes - often - always

3. I avoid using aerosol sprays.
- never - sometimes - often - always

4. I turn the television off when it is not in use.
- never - sometimes - often - always

5. I take short showers to limit water use.
- never - sometimes - often - always

6. I recycle newspapers.
- never - sometimes - often - always

7. I buy products with minimal packaging (for example, products that are packaged in a minimal amount of plastic).
- never - sometimes - often - always

8. When inside, and if sufficient sun light is shining through the windows, I use sun light as opposed to artificial light.
- never - sometimes - often - always
9. I use the washing machine only when it has a full load.
- never ~ sometimes ~ often ~ always

10. I compost non-meat food scraps.
- never ~ sometimes ~ often ~ always

11. When writing I use both sides of the paper.
- never ~ sometimes ~ often ~ always

12. When travelling short distances (~ Approx. 1 – 2 Kilometers) I walk as opposed to driving or taking a bus.
- never ~ sometimes ~ often ~ always

13. When cleaning my teeth I turn the tap off rather than leaving it run.
- never ~ sometimes ~ often ~ always

- never ~ sometimes ~ often ~ always

15. When I buy a few items at the store I say no to plastic bags.
- never ~ sometimes ~ often ~ always

16. I turn the stereo/radio off when it is not in use.
- never ~ sometimes ~ often ~ always

17. When available I half flush the toilet as opposed to full flush.
- never ~ sometimes ~ often ~ always