THE PERCEPTIONS OF ENVIRONMENTAL KNOWLEDGE, GLOBAL WARMING AND ATTITUDE TOWARDS ENERGY AND WATER UNIVERSITAS NEGERI JAKARTA STUDENTS

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ABSTRACT

Environmental education is assumed to have a significant influence on the environmental awareness, everyday lifestyles and attitude behavior of students. Several higher education institutions have recently recognized the importance of integrating sustainability issues into education to make this impact focused and explicit. This paper explores the relationship strength between environmental education and environmental knowledge, attitudes and reported actual behavior of high school students, providing a comparative questionnaire survey analysis which is unique in the literature. The results show a strong correlation between the intensity of environmental education and the environmental knowledge of students and attitude in relation to energy consumption, water comsumption and global warming knowledge

KEYWORDS: Environmental Knowledge, Global Warming, Attitude

INTRODUCTION

Global warming is one of the most important challenges currently facing the world. The adverse impacts of global warming can be catastrophic and a potential threat to the humanity existence. Therefore, it is essential for everyone, especially those in the scientific community to have a full appreciation of the issue as well as the potential solutions to the problem so that they can initiate the necessary changes to the economies, resource utilization, behavior, and general approach to nature (Aydin, 2010). Science education aims to promote students' understanding of science concepts and the application of their understanding to solving real world problems, including global warming issues. However, students themselves need to have a clear understanding of the global warming issues in relation to other factors such as the impact of biotechnology on the environment before they can act as effective changing agents within the larger society (AbuQamar et al., 2015).

In many developed countries around the world, specific Environmental Education (EE) programs have been implemented in their educational systems. EE suggests a structured learning process, in which the issues of climate change and other environmental subjects can be approached in an integrated way through out all educational levels (Liarakou and Flogaitis, 2007). This is not the case in the Kingdom of Bahrain, since there is no formal EE program implemented at any educational level and thus the knowledge that most students acquire does not come from their education but rather from other sources mainly the media including television, radio, newspapers, World Wide Web, social media, etc. Such sources are not always reliable and can deliver misconception (Liarakou et al., 2011). In addition, Rickinson (2001) has stated that television is the main source of information for students on environmental issues through

nature programs, news and documentaries with more attention given to the impacts of global warming and greenhouse effect rather than discussing possible solutions and the main causes of these events.

The relationship between environmental knowledge, attitudes and behaviour is complex and there is considerable disagreement about whether they are related, and about the direction of any causal links (Hines et al., 1987). A number of advanced models have been developed to test the mediating and moderating influence of particular variables on the attitudeebehaviour link, and to explore the specific conditions whereby an attitude may impact upon behaviour (Barr, 2007).

Onur and Timothy(2014) results show that revealed commitment to the environment andconservationeffectively translates into actionto conserve resources. This translation of attitudes into action may involve some sacrifice or inconvenience from reduced consumption of energy. On the other hand, these actions may simply reflect a preference for higher environmental quality, so that these households derive utility from preserving environmental resources

Moreover, Eirini e t al (2015) argued that harmonious coexistence of humans with the natural environment is a prerequisite for our survival and that our primary concern should be to encourage the efforts to save energy (72.28%), since energy saving is essential for the protection of the environment and human health (77.51%). The majority of students agreed that the balance of nature is very delicate and easily disturbed. A percentage of 61.45% of the students recognize the need for gradual replacement of conventional forms of energy with renewable ones, while 20.48% of them have a neutral attitude towards the need of rejecting conventional forms of energy

Barr (2007) in a UK study, explores environmental values, situational characteristics, and psychological factors in relation to waste management behaviours. His results show that recycling is characterised as a highly normative behaviour (which can be influenced by increasing awareness); but reduction and re-use are predicted by underlying values which are more difficult to influence. He warns however that behaviour must be seen in context e thus generalisations in this area are problematic. According to Tikka et al. (2000), an individual's attitudes, the extent of nature-related activities, and knowledge about the environment are correlated with one another but the educational backgrounds of individuals also appear to affect responses. In addition, other underlying factors e such as gender e function as mediating variables.

In terms of the link between knowledge and behaviour, studies of university students suggest that high levels of knowledge about sustainability do not necessarily lead to more sustainable behavioural choices, although a lack of knowledge may make it more difficult for them to select the most appropriate behaviour. In both New Zealand (Shephard et al., 2009) and the UK (Cotton et al., 2015a) research has found significant confusion among students about appropriate pro-environmental behaviours which limits the efficacy of their subsequent activities. However, although improving information about energy use is important, it may not be sufficient to influence behaviour, since other factors such as convenience and cost are likely to intervene. A national survey of UK students focussing on energy-saving behaviour, found that 72% of respondents claimed to take energy-saving actions but only 25% reduced their personal air travel (Drayson et al., 2013).

Water shortage is a key factor preventing sustainable social and economic. Three key aspects of water resource management are to control the total amount of water consumption, to improve water use efficiencies and to control the total amount of pollutants discharged into rivers and lakes (National State of China (2012)).. Measures for controlling the

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total amount of water consumption include strict planning management and waterresource evaluation, the control of water consumption in each region and watershed, water-use permission, paid use of water, strict management and protection of underground water, and a unified allocation of water resources. Measures for improving water-use efficiencies include improved management, the introduction of water quotas and the expansion of water-saving technologies, whereas measures for controlling pollutants discharged into rivers and lakes include the management of water functional areas, the protection of drinking water-source areas and the protection and restoration of aquatic ecological systems.

Positive results such as more vegetation and reductions in agriculture water use, groundwater exploitation and high-waterconsuming crops have appeared in the Shiyang River Basin in recent years (Zhu and Li, 2014). These achievements can be largely attributed to mandatory agricultural water-saving measures (Chang et al., 2016).This study found that farmers are likely to support these policies, due to the beneficial consequences of these policies, and open and fair policy enforcement. Environmental values and collectivism had mediated effects on the attitudes of farmers toward mandatory water-saving policies.

Genying et al (2016) research about mandatory water-saving policies in northwest China These findings support the argument that proenvironmental behaviors are value based. Subjective norms had a weak correlation with attitudes, and demographic variables had insignificant correlations with attitudes. Arguably, these two results can be ascribed partly to the mandatory nature of the watersaving measures involved in this study. Policy implications include propagandizing these policies among local farmers, strengthening open and fair policy enforcement, and cautiously using water prices as an instrument to control irrigation water.

Other studies have found that environmental concern directly leads to more participation in water conservation (Willis, et al. 2011)., based on the results of this study, looking at environmental concern and sociodemographics alone is not sufficient to explain environmental behavior.

A study by Erika (2014) explored how New Environmental Paradigm scale and sociodemographic characteristics influence personal water conservation activities. Using a survey conducted in the spring of 2010 of Oregon residents,finding that the interaction of environmental concern and sociodemographics that predict identified water conservation behaviors are considered. Willis et al. (2011) conducted a study of water use in Gold Coast city, Australia and found that "residents with very positive environmental and water conservation attitudes consumed significantly less water in total..." (Willis et al., 2011).

On the basis of the literature, this paper aims to extend research Perceptions of Environmental knowledge, Global warming and Attitude pro-environmental activities of Jakarta High School Students. The research is exploratory and part of a larger study that will determine the extent to which impact on students' attitude in relation to energy consumption, water comsumption and global warming knowledge

METHOD

The Instrument

This study was based on a primary survey using a questionnaire (Table 1, 4 and 5) that was based on the Environmental Issue Questionnaire that was developed by Boyes et al. (1993) and Liarakou et al. (2011). A multiple choice and true and false questions were used in this survey.. The questions covered three aspects of the global warming

including causes, impacts, and solutions based on the study of Liarakou et al,. Five of the questions were created to test the attitude of students towards energy, and water

A reliability analysis was carried out in order to examine the internal consistency of its questions. The value of Cronbach's alpha was 0.70 implying that the instrument was consistent and reliable in achieving the study objective.

The Study Group

The questionnaire was distributed in June 2014 among the first and fourth year students at the Universitas Negeri Jakarta, Department of Biologyand Department of Chemistry. Universitas Negeri Jakartais the lone governmental university harboring the largest number of students among all the universities in the Jakarta.The study group included all enrolled students (N = 120) in which the majority of them were female (93) with an age range from 18 to 21 years old. The questionnaires were distributed during lectures or laboratory sessions to guarantee that the students have relied solely on their knowledge to answer the survey questions.

RESULTS AND DISCUSSIONS
Students' Knowledge the Sources of Environmental Knowledge

The percentage distributions of the student answers to the question, What are the sources of for their environmental knowledge? are provided in Figure 1.According to the students' answers, 82% described the television as a source of environmental knowledge, while 78.% described teacher, 70% described friend, 65 % described the parent, 54% as book and magazine of environmental knowledge
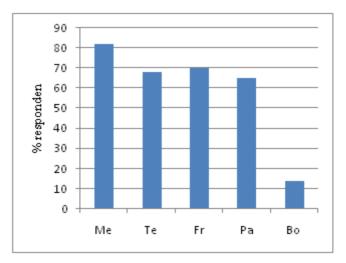

Figure 1: Student Knowledge Regarding Sources of Environmental Knowledge: Me= Media, Te = Teacher Fr=Friend, Pa = Parent, Bo = Book

However, students to have different drivers and information sources for their environmental knowledge (see Figure 1).. High school students ranked the media first, teachers, and then book, magazine following last (some way below). The importance of the Internet as a source of information was relatively high for high school students. Parents, siblings, friends, acquaintances and certain teachers also appeared as sources of information). Actual knowledge about the environment was appraised based on how many environmental problems students could list. The most important problems mentioned for were air, soil and water pollution, climate change, biodiversity loss, destruction of wildlife, as well as

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catastrophes, urban problems. and temperature of earth.

Students' Knowledge about Impact and Solution of Global Warming

The study results also demonstrated that most of the students believed that global warming was taking place, and that they were concerned regarding the serious consequences global warming might have; however, they still considered the amount of information they had on global warming as insufficient. In addition, the students were of the opinion that renewable energy, decrease electricity, use would reduce global warming, and that renewable energy sources are environment-friendly, non toxic and renewable.The questionnaire items regarding global warming are provided in Table 1

Table 1: Questionnaire True/False Items. About Impact and Solution Global Warning

No	Question Item
1	The Kyoto Protocol concerns the reduction of the greenhouse gases and thus global warming
2	Global warming will not lead to displacement of human population
3	Global warming would be reduced if more of our electricity was made from renewable sources
4	Carbon dioxide is a gas that has contributed to aggravating global warming
5	Decrease electricity consumption at home e can do decrease global warming
6	The use of renewable energy accelerate global warming
7	The use of public transport instead of private cars can contribute to minimizing global warming
8	At present, the major environmental problem that causes global warming is air pollution
9	Due to global warming, important climatic changes such as all of the followings can occur abnormal diseases
10	The increase emission of gases from fossil fuel burning causes global warming

The results of percentage of correct and incorrect answers regarding global warming impact among first and fourth year students of different department are recorded in Table 2. Students' knowledge regarding impacts of global warming was higher third years student of all departments. Natural Science third year student scored the highest correct answers percentage (76 ± 0.20%), whereas social science fitst year students had the lowest score (52± 0.18%).

Table 2: Percentage of Correct and Incorrect Answers Regarding Global Warming Impact Among First and Third Year Students of Different Departments

Causes Questions	Chemistry Depart Class 1 St Year. n = 32	Chemistry Depart Class 3 Th year. n=35	Biology Depart Class 1 St year. n = 30	Biology Depart Class 3 Th Year. n=35
Correct answers (%)	52± 0.18	70± 0.19	68± 0.18	76± 0.20
Incorrect answers (%)	48± 0.20	30± 0.20	32± 0.17	24± 0.20

Similarly, students' knowledge regarding solutions toward global warming was higher among third year students of all departments. (Table 3). Natural science third year students scored the highest correct answers percentage

(78 ± 0.14%), whereas social science first year students had the lowest score (53 ± 0.19%).

Table 3: Percentage of Correct and Incorrect Answers Regarding Solution of
Global Warming among First and Third Year Students of Different Departments

Causes Questions	Chemistry Depart Class 1 St Year. n = 32	Chemistry Depart Class 3 Th year. n=35	Biology Depart Class 1 St Year. n = 30	Biology Depart Class 3 Th Year. n=35
Correct answers (%)	53± 0.19	75± 0.25	63± 0.25	78± 0.14
Incorrect answers (%)	57± 0.25	35± 0.25	37± 0.25	22± 0.25

In general, many factors have a strong influence on environmental awareness among students, firstly, the prevailing education system in general and the curriculum in particular. In addition, there are other key factors which normally contribute to students' understanding of environmental issues including the media, and public/government sponsored awareness programs. Therefore, strategic intervention is required to enhance the media coverage on environmental issues and global warming. Government also needs to focus its efforts on programs aimed at educating the public on global warming issues (Rideout, 2014).The students' answers' regarding global warming indicated that 86% were very concerned about its effects on theenvironment. Furthermore, 45 % of the students expressed that they knew a little about global warming, Among the students, 91% considered that global warming can be reduce If we used the sun, wind and waves to make energy more

Impact of Environmental Education on Students' Thinking and Attitudes
Attitudes about Transport

The 'pro-environmental behavior' of students was characterized through analysis of transport habits and everyday lifestyle choices. Transport habits are partly determined by the distance of the school from home as well as by the modes of transport available.. This characteristic is independent of environmental attitude but has a great influence on choice of transport. A far bigger proportion of highschool students (12%) walk to their place of study while the latter use public transport much more often (44%), and 14% to use their own cars, while 'park and ride' transportation is more commonly used by high school students (and their parents), probably also due to the greater distances. Traveling by bike was more common for the students sample, about 13-15% of the students use a car everyday in some way.

Responses about the use of public transport are greatly distorted by those who already travel using this method of transportation, but correcting for these answers it is possible to say that 69% of the remaining social science students and 60% of the remaining natural science students would switch to public transport if conditions improved. Interestingly, the desire of high school students to switch to using a car was independent from the distance they had to travel, and this was also true of public transport. Only in the case of bicycles did we find the expected inversely proportionate relationship to distance. In both samples, the desired mode of transport was related to the current mode: those who walked or traveled by public transport at the time of surveying reported that they were more willing to switch to bikes than car-users. Public transport would be most preferred by those who currently use it in combination with driving, probably because they were obliged to use solutions due to the inadequacy of public transport. In the high school sample, those who used bikes would not choose to travel by car even if they could. Regarding everyday behavior, the vast majority (65%) of high school students consider themselves to be more environmentally conscious than their peers. Their self-reported consumption

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habits certainly justify this claim in favor of the high school group but it should be noted that a self-reporting bias is present for this sample group.

Attitudes towards Energy

Table 4: Questionnaire Items. About Attitutde towards Energy

Attitudes Questions	Always	Sometimes	Never
save energy,	59,60	30,92	12,05
turn off the light when we are the last leave your school class	24.15	29.56	46.29
open the windows or the doors when the air condition or the heading system is on	10,04	24,90	65,06
try to find other classmates with the same interest in the saving of energy	29.72	33.33	19.28
influence what university do about energy problems	31.16	24.12	44.72
you turn all the lights when entering your house	24.48	28.68	46,84
turn off the stand-by button of your PC or TV set	27.38	30.26	42.36

Based on the answers to questions concerning attitudes, the majority of students (59.60%), recognize that primary concern should be to encourage the efforts to save energy, since energy saving is essential for the protection of the environment and human health. A relatively higher percentage of students never open windows or doors when the air conditioner or the heating system is on(65.06%). A percentage of 46.29 % of the students never turn off the lights when they are the last to come out of a room, while only 24.15% of alwayasthem turn off the lights when they come out last from their school class. In Table 3 we observe that 53.16% of the students always or sometimes lit the lights when entering their house, while 46.84% of them never do. A percentage of 42.36% of the students always switch off the TV or the computer from the main power button and 57.64% of the students switch off the TV or the computer when they are occupied with something else. The mayority of students always influence about energy problems in the campus, however. notable is the relatively high percentage of students who never with this problem

Attitudes towards Water

Table 5: Attitude towards Water

Attitudes questions	Always	Sometimes	Never
Save of water	48,27	30,92	12,05
Turn off water while brushing teeth	48.21	29.56	46.29
Turn off water while hand washing dishes	44.15	24,90	65,06
Collect rain water in barrels or bucket	31.05	29.57	19.28
Use minimal water for cleaning and laundry V	32.20	25.62	42.18
Make sure that taps do not drip.	24.48	28.68	46,84
Taking shorter showers/using less bath water	29.28	29.46	41.26

In Table 5 we observe that 55.92% of all the student 's surveyed in the sample agreed that it was important to use minimal water for cleaning and laundry. Relatively higher percentage of students always close the tap when washing their hands or their teeth (44.15% - 48.21%%) and never collect rain water in barrels 65.06%. Based on their attitude, 32.20% and 25.62% of student's always and sometimes to the use minimal water for cleaning and laundry. The attitudes of the

respondents surveyed were using less bath water with 58.74% either alwayis or sometimes with the statement compared to 41.26% who never

CONCLUSIONS

Global warming is one of the most important challenges currently facing the world. The adverse impacts of global warming can be catastrophic and a potential threat to the humanity existence. Therefore, it is essential for everyone, especially those in the scientific community to have a full appreciation of the issue as well as the potential solutions to the problem so that they can initiate the necessary changes to the economies, resource utilization, behavior, and general approach to nature.The results showed attitude towards energy and water having corelated with environmental education.

ACKNOWLEDGEMENTS

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