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Metacognitive Thinking and the Effectiveness of the Inquiry Approach on Value Attitudes and Motivation towards Environmental Education among Primary School Students in Malaysia

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Abstract: Education has been accepted as a fundamental tool for environmental control as well as sustainable development. Environmental Education refers to a planned effort made to educate the community either formally or informally so that the well-being and survival of the community and the environment are preserved and sustainable. Metacognitive thinking and inquiry approach methods are closely linked to the nation's goal of building a sensitive society and possessing accurate knowledge, skills and values on environmental issues and the ability to contribute to the solution of environmental problems. In Malaysia, efforts to strengthen environmental education began at the school level with the publication of the Teacher's Guide of Cross-Curriculum Education for secondary and primary schools by the Curriculum Center of the Ministry of Education Malaysia, in 1982. However, the core subjects have failed to be implemented in the curriculum of the national education system. As a result, the students were found to lack environmental values, decision-making skills and solving problems related to the environment. This is because various issues related to the environment are still discussed, including discussions from a conventional point of view as well as from an Islamic perspective. Various conferences at both the international and national levels are held in an effort to form good practices and interaction of community members, especially the younger generation with the environment. However, there are some related matters that should be studied and scrutinized in advance so that the various efforts that have been implemented and planned later are truly effective and able to apply high values of sustainability to the environment among students, including joint responsibility in preserving the environment.

Keywords: Environmental education, good practices, environment values

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1. Introduction

Environmental pollution is a global issue that needs to be taken into account by all parties so that the issue of environmental pollution can be addressed together. It is an issue that is seen as increasingly critical and is gaining widespread coverage either in the local or international media. What is meant by pollution so that it becomes a national issue and discussion among world leaders? Pollution is a change either directly or indirectly to the environment resulting in various adverse and dangerous effects either to humans, plants and animals [1].

What is causing the increase in environmental pollution issues? If you look at the results of mass media reports and from past studies, the issue of increasing environmental pollution in Malaysia and the international world is associated with human attitudes, selfishness, indifference to the environment and non-compliance with guidelines by the government. Weak law enforcement also contributes to the increasingly critical pollution problem that has led to the occurrence of various natural disasters that are extreme and unpredictable by the human mind.

Has the quality of the environment improved with the various methods and programs that the government has undertaken? The deterioration of the quality of the environment from the present time is seen as increasingly critical as there is no solution. Various approaches and methods have been implemented by organizing various awareness programs to all levels of society but did not bring a satisfactory effect. Why is this happening? This is due to the attitude of man himself who is too concerned with economic development, chasing double profits and not in accordance with the scope of legislation that has been set. This situation has caused the quality of the environment to worsen, leading to various natural disasters and resulting in losses worth millions of ringgits as well as significant loss of life. Development in a country is very necessary to generate the national economy and be competitive with developed countries but it must be in line with sustainable development to maintain ecological balance. If it is not practiced by human beings and even human beings with their greed and arrogance continue to do various forms of unsustainable development, the earth will surely lead to destruction and ruin.

What are the roles that must the government play? The state desperately needs to raise public awareness in an effort to produce individuals who have positive behaviors, a caring society and are responsible for the environment [2]. Awareness needs to be given from a lower level. Therefore, students become the main focus to be educated and instilled with the spirit of love for the environment. What is the most appropriate education to accomplish this mission? Environmental Education is seen to make a significant contribution to the resolution of environmental issues because it is closely related to the country's goal to build a society that is sensitive, caring and able to contribute to the country [3].

Why is Environmental Education important in carrying out this mission when many other programs either by statutory bodies and NGOs have been implemented? Education is one of the best solutions to form a generation that has a high level of knowledge and awareness of the environment. Through Environmental Education it is seen to help increase human motivation, values and attitudes to manage natural resources and maintain the quality of the environment. It coincides with the goal of environmental education to form a society that is responsible and caring for the environment as well as having high knowledge, skills, values and commitment in order to resolve environmental issues [4]. Therefore, the application of noble values to human beings through environmental education can form a Malaysian society that is ethical and responsible for the environment [5]. Why should the application of environmental education start at the level of primary school students when they are still minors and why not continue to adults? Efforts to strengthen environmental education must start from the primary school level because there is a proverb that says strike the iron while it’s hot. However, school students have different levels of thinking towards the reception of information during the teaching and learning process. Thus, metacognitive which refers to high -level thinking is required in performing complex cognitive tasks for problem solving involving various cognitive operations i.e. the process of exploring

towards forming questions, making discoveries, investigations and subsequently acquiring a new knowledge. Is metacognitive thinking seen as one of the effective methods to achieve learning objectives? If past learning emphasizes one-way learning, students only accept what is given by the teacher but through metacognitive thinking along with cognitive strategies students need to explore a given problem, find solutions and interpret the information obtained. The analysis of the findings is done as a result of the discovery of the solution path and its shortcomings will be corrected for better results over time. From the above statement, it is clear that metacognitive thinking along with cognitive is one of the best methods to solve environmental pollution issues.

2. Materials and Methods

2.1 Materials

Since the independence on 31 August 1957, Malaysia has implemented various very encouraging socio -economic development programs. All these achievements and successes are the result of the high efforts and commitment of the government and certainly involved a very big change to the national landscape.

However, despite enjoying various successes, there are still some people who are not responsible for the environment, which has a detrimental effect on the quality of the environment. Various preventive measures have been taken to overcome this problem as shown in Figure 1. It started with a conference in Stockholm in 1972, the Earth Summit Conference in Rio de Janeiro in 1992 [5] and then a conference in Johannesburg South Africa in 2002.

Figure 1: Preventive measures on aspects involving the environment

Looking at the year of the conference held above, the period until 2021 has been exceeded 20 years but has the problem of environmental pollution decreased? Researchers see this issue as having no end. This is proved by the occurrence of various natural disasters in the country. For example, river pollution from the dumping of toxic waste from factories has affected human and animal life resources, combustion haze problems affect human health and various diseases such as Minimata in Japan and limb deformities due to radiation and photochemical fog in Los Angeles [6]. The impact of development in upland areas also causes erosion and landslide phenomena. This has been evidenced by a tragedy that shocked the country in 1993, the tragedy of Highland Towers, a condominium development on the hillside, has collapsed to the ground, resulting in 170 deaths. In addition, TV3's report through Buletin Utama on 17th February 2006 published the news of land encroachment around Cameron Highland resulting unrestricted erosion, causing landslides that could endanger human lives and result in widespread deforestation. States that have experienced rapid development from the manufacturing sector such as Penang, Kuala Lumpur, Selangor and Johor are also among the contributors to the quality of the river is increasingly affected due to the dumping of toxic waste into the river. Based on Table 1 and Figure 2, the results from the Putrajaya Low Carbon Green City Initiative Report 2012 shows the sectors that contributed to high carbon emissions which has increase the environmental pollution in year 2017.

Table 1: Putrajaya Low Carbon Green City Initiative Report (2012)

No	Sector	Carbon released
1	Office	180 ktCO2eq
2	Transportation	161 ktCO2eq
3	Waste	148 ktCO2eq

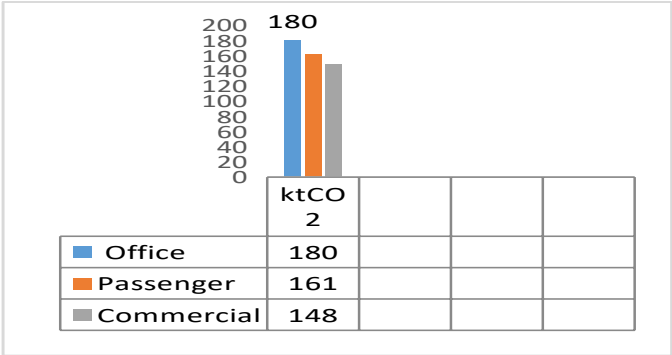

Figure 2: Graph of Sectors Contributing to Carbon Emissions

The analysis shown in Table 2 and the findings in Figure 3 expect the commercial sector to be the main contributor in carbon emissions of 1435ktCO2eq with an increase of 95.4 percent and the passenger sector 1313ktCO2eq with an increase of 87.7 percent. This situation is definitely a concern for the government and there are definitely various drastic measures that need to be taken because it involves future generations and also has a negative impact on politics, economy and society.

Table 2: Percentage Increase in Carbon Emissions in 2025

No	Sector	2025/ ktCO2eq	Increase/percentage
1	Commercial	1435	95.4
2	Passenger	1313	87.7

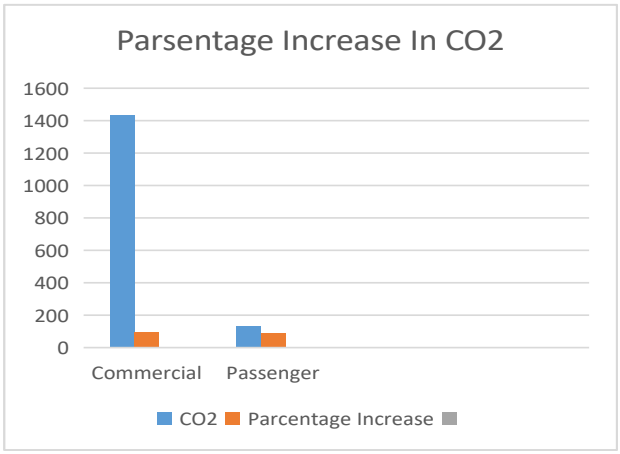

Figure 3: Graph of CO2 Increase in 2025

From the above findings, do the government need to take drastic action? Drastic action has been taken by the government with the establishment of the Ministry of Energy, Green Technology and Water (KETTHA) to address the problem of environmental and natural resource pollution, improve human health and life and preserve ecosystems.

Based on the report from the Putrajaya Low Carbon Green City Initiative in 2012, what should be done by the government in controlling environmental pollution? The government has introduced green technology which is considered as one of the best measures to meet the high energy demand while minimizing environmental damage [7]. This is because technology plays a very important role in the sustainable development and processing of natural resources in meeting human needs in improving the quality of human life and the sustainability of the next generation of young people [8].

Why is it able to improve the quality of life and provide reassurance to future generations? This is because green technology greatly leverages the use of nanotechnology in product manufacturing and is able to contribute to environmental sustainability due to efficient atoms, waste disposal and high expertise converting sunlight into energy [7]. So what are the advantages of green technology to Malaysia? In 2012, UNESCAP indicates that it can improve production efficiency through the reduction of input costs, energy and maintenance costs that can improve the company's image and economy while environmental sustainability can be maintained.

Are there other factors that contribute to pollution? Yes, there are many other factors that contribute to pollution such as river pollution from the discharge of toxic waste from factories has affected human and animal life resources, haze problems from combustion affect human health and various diseases such as Minimata in Japan and limb deformities due to the effects of radiation and photochemical fog in Los Angeles [6].

The impact of development in upland areas also causes erosion and landslide phenomena. This has been evidenced by a tragedy that rocked the country in 1993 that the tragedy of Highland Towers, a condominium development on the hillside, has collapsed to the ground resulting in the death of 170 people. In addition, TV3's report through the Main Bulletin on 17 February 2006 broadcasted news of land encroachment around Cameron Highlands resulting in unrestricted erosion, causing landslides that could endanger human lives and result in widespread deforestation. States that have experienced rapid development from the manufacturing sector such as Penang, Kuala Lumpur, Selangor and Johor are also among the contributors to river quality being affected due to the dumping of toxic waste into the river.

Air is a basic need for humans, plants and animals. Air pollution is now at a very alarming level and it is due to human activities that are so greedy to do various developments without following the guidelines that have been set. What are the factors causing the increase in air pollution? The manufacturing sector in Malaysia is one of the causes of the increase in air pollution [9]. Uncontrolled activities such as garbage burning and religious activities also contribute to the increase in air pollution.

In order to overcome the problem of environmental pollution, are there any relevant studies to address it. Several studies related to environmental issues have been conducted to identify the level of thinking, values and attitudes of Malaysians towards the environment. As shown in Table 3, a study entitled "Environmentally Friendly Practices: A Study of Environmental Knowledge in Sabah and Sarawak", found that the level of public awareness on environmental issues around the world is balanced both in developing and developed countries [10] .However the quality of the environment is deteriorating and will not recover in the future due to human irresponsible attitudes [11]. Furthermore, in a study conducted by [12] in Kuala Lumpur and Penang entitled Knowledge, Attitudes and Practices of the Malaysian Community Towards Environmental Issues, found that the level of community knowledge on environmental issues vary according to an event that occurs.

Students are an essential group in the government's efforts to overcome the problem of environmental pollution. What are the factors that influence students' knowledge, attitudes and thinking related to the environment? Teacher delivery methods are very important. This is evidenced through a study on teachers who teach Science subjects in primary schools conducted by [13]. The results of the study stated that the delivery method of Science teachers can improve students' knowledge and behavior towards the environment.

What about the attitude of students at local and private universities? Students are the educated group who are the backbone of the country to build the country towards excellence in terms of politics, economy and social in the future. Are these groups concerned with the current situation and together carry out responsibilities towards the environment? In a study by [14] on 360 undergraduate students at Universiti Kebangsaan Malaysia, found that several aspects can influence students' attitudes and commitment to the environment such as field of study and peers. There were significant differences between groups of students from the Pure Science, Social Science and Professional Studies streams in terms of commitment and environmentally friendly behavior.

Table 3: Environmental studies conducted in Malaysia

No.	Researcher	Title	Year
1	Ahmad J	"Environmentally Friendly Practices" A Study of Environmental Knowledge in Sabah and Sarawak	(2012)
2	Tan dan Norzaini Azman	The flow of education among higher education students influences students' commitment to the environment.	(2011)
3	Nurul Hidayah Liew Abdullah, Haryati Shafii and Seow	Science teachers' delivery methods during the teaching and learning process can enhance students' knowledge and behavior towards the environment.	(2013)
4	Jamilah Hj Ahmad, Hasrina Mustapha, Hamidah Abdul Hamid and Juliana Abdul Wahab	The level of knowledge of the Malaysian community is different on an issue that occurs.	(2011)

What about researchers from abroad? Many studies are conducted by researchers from outside on environmental pollution issues that can be taken advantage of by researchers in the country in addressing the worsening pollution issues. As shown in Table 4, Singletary in his study of seven teachers from six high schools in Illinois stated that the best method during which the teaching and learning process takes place is the discussion method [15].

Furthermore, Samuel has proved that teachers have a poor level of knowledge, understanding and conception of environmental education resulting in not being able to master the issues of the subject in depth [16]. The implication is that the knowledge imparted does not achieve the objectives and it will leave a negative impact during the teaching and learning process that takes place.

Next, Smith-Sebasto and Smith conducted their study of 500 school teachers in Illinois, finding that financial resources were a major factor influencing teacher attitudes during the teaching and learning process taking place [17]. It is also evidenced in Grab's study of the structure module of attitudes and behaviors towards the environment stating that behaviors towards the environment are rooted in one's personal philosophical and emotional values [18]. Someone who has positive values in themselves definitely gives a positive response and so is the opposite attitude.

It is clear from the studies conducted by previous researchers, whether domestic or foreign, are continued to strive to find the best methods and solutions to address the problem of environmental pollution.

Table 4: Environmental studies conducted abroad

No.	Name	Research	Year
1	Singletary	Studies show that the discussion method is the best method for teaching the subject of Environmental Education.	(1992)
2	Samuel	The level of teachers' mastery in the knowledge, understanding and conception of environmental education is weak	(1993)
3	Smith-Sebasto and Smith	Teachers do not have high diligence when teaching the subject of Environmental Education on the grounds of lack of financial resources, do not have enough time to prepare, lack of knowledge and more focus on other more important things.	(1997)
4	Grab	The practice of an individual's pure values towards the environment stems from one's personal philosophical and emotional values.	(2004)

2.2 Methods

This study is qualitative in nature involving library research. The data collection methods used was case study analysis, articles, books and discourses. While the data analysis method uses descriptive analysis methods that are appropriate to the objectives of the study to clarify the metacognitive definition, inquiry methods and increasingly chronic environmental pollution issues seem to have no solutions.

3. Results and Discussion

3.1 Development of environmental education

Environmental Education in a country is not the same because it is related to the national goal which aims to build a caring society, highly skilled, has positive values on environmental issues [3]. A country has high hopes that the environmental philosophy will be successfully implemented and the country will be able to control environmental pollution from spreading to result in various natural disasters and loss of life.

Environmental Education has been implemented in the school system in the country since the 60s with the use of different names such as Education outside the Classroom, Natural Education, Community and Environmental Management Education [19]. Palmer and Neal stated that Environmental Education has been defined as a process of identifying values, explaining concepts for the construction of skills and behaviors to understand the relationship between humans, the environment and the culture practiced [20].

Lucas stated that in human endeavor to pursue development based on modern technology, human beings need to maintain environmental balance by adhering to three principles in environmental education namely education in environment, education about environment and education for environment [21]. The balance of nature is very important and human beings need to be responsible for maintaining it ecologically sound. Thus, an enactment of the act as recognition of the role played by Environmental Education on society was formed by the Committee of Ministers of the Council of Europe [22].

Recognition of Environmental Education is divided into two streams, the first stream which considers the environment as a strategy that prioritizes the formation of scientific knowledge and the ability to manage problems related to the environment. The second stream states that the study dimension of Environmental Education needs to inculcate a sense of responsibility towards the environment. The combination of these two streams is able to evoke a spirit of environmental awareness. However, the definition of Environmental Education, vision 2020 is more focused on the main goal for environmental greening. According to WWF Malaysia, the definition is very suitable to be practiced in Malaysia because it is a process of helping the community through formal and non-formal education to acquire understanding, skills and values that will enable them to be active citizens in modern development while maintaining sustainable development for the benefit of present and future generations. If development without ecological balance continues, the country will continue to be hit by the problem of environmental pollution that causes various disasters to the detriment of the country and can cause human lives to be lost.

3.2 Environmental knowledge

Knowledge is the capacity to acquire, retain and use information. According to Ibrahim, natural knowledge is a way of acquiring ideas through perception, imagination, memory, judgment, abstract concepts and considerations [23]. Ahmad et al. in her study entitled Knowledge, attitudes and practices of society Malaysia on environmental issues states that the level of knowledge of Malaysians is different according to their respective fields and levels of knowledge [12].

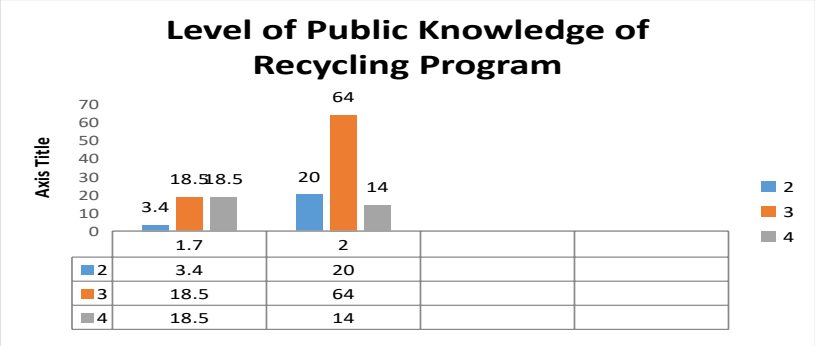

Figure 4: Level of Public Knowledge on Recycling Program

As shown in Figure 4, the level of public knowledge on noise pollution in Malaysia shows that the knowledge of Malaysians is still at a low level. The overall mean for Penang is 3.28 and for Kuala Lumpur it is 2.90.

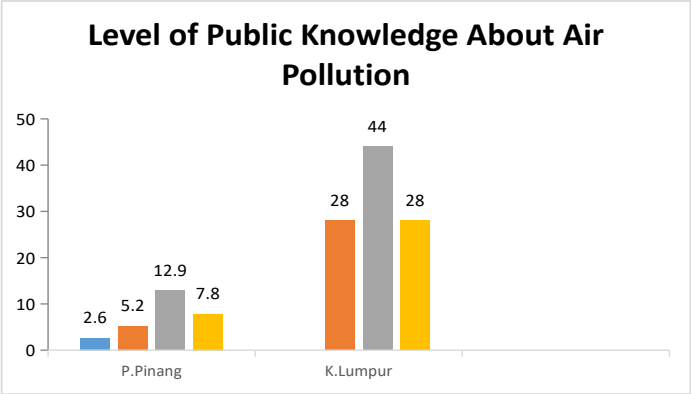

Figure 5: Level of Public Knowledge about Air Pollution

As in Figure 5, the level of public knowledge on air pollution is also at a moderate level with Penang overall mean 2.68 and Kuala Lumpur 2.00. The level of public knowledge on natural disasters in Malaysia is also still at a low level.

3.3 Theories and methods

The inquiry approach uses cognitive theory, in which students have the freedom to create new meanings and meanings from what is learned and the teacher simply acts as a mentor. The inquiry approach can enhance students 'understanding of learning as students explore, analyze, generate ideas, make translations and subsequently make decisions from learning outcomes. Experiential learning can produce quality outcomes and in turn can improve learning performance. Cognitive Theory attaches great importance to student behavior (hands on) and mental activity (minds on) where students have their own ideas about a phenomenon before the teaching and learning process. Interpretation occurs based on students 'perceptions will improve comprehension [24]. While completing a cognitive task, there is an assessment of progress on the understanding of a given problem followed by strategic modifications so that sophisticated problem solutions are obtained [25].

Learning through inquiry method is a situation where students have the skills to solve. Students need to be given exposure to learning that involves a process of exploration where there is a process to encourage questioning, investigation and experimentation to gain new knowledge [26]. A study conducted by Richard and Kiza showed the occurrence of an improvement to students 'understanding [27]. This is because it is a process of exploring towards forming a question, making a discovery, and investigating a discovery to gain a new knowledge.

3.4 Metacognitive thinking

Metacognitive thinking is a high-level thinking that students need to have in order to perform problem solving in highly challenging cognitive tasks [28][29]. The metacognitive aspect is very necessary because during the occurrence of metacognitive thinking it is accompanied by cognitive and affective that guarantees success in solving a problem [30][31]. Therefore, an individual needs to possess cognitive knowledge to coordinate information and perform monitoring.

Learning through metacognitive methods, teachers will be able to manage learning that requires students to plan, evaluate and regulate their learning process. Positive effects on students in the final stage's students are able to master and control their own learning through the practice of assessment

and self -management in the learning process. The use of metacognitive teaching methods among teachers will be able to monitor and assess students' processes in completing assignments and identify work outcomes for assessment.

Metacognitive skills, on the other hand, allow students to adapt a variety of very difficult tasks and subsequently plan strategic uses that can generate solutions that have a positive impact. This is because without cognitive knowledge, students do not have sophisticated strategies to enable the occurrence of new solutions [32]. As a result, students are able and confident to formulate problem-solving strategies effectively.

3.5 Attitudes toward the environment

Human attitudes are divided into two, namely positive and negative attitudes. According to Yount and Horton, an attitude towards the environment is seen as a persistent positive or negative feeling towards certain aspects of issues involving environmental problems [33]. From its affective aspect, attitudes toward the environment involve intellectual abilities and pre-existing knowledge, as well as the measurement of degrees that involve emotions toward the environment. Dunlap and Van Liere have proposed the New Environmental Paradigm (NEP) for measuring attitudes unidimensionally [34]. Proponents of the NEP have made the notion that one’s moral values are a core concept to attitudes towards the environment.

Based on this notion of NEP, each individual will be considered to have a pro-environmental attitude when moving from a negative to a positive attitude. This shift is a reflection of a broader and more comprehensive perspective on nature and it can be aligned with the scope and critical problems involving the environment today.

3.6 Values for the environment

Value is an ongoing belief in the individual that becomes a social choice. It is considered a general concept that has something abstract. Value also has an active component because it involves cognitive emotions where it is a processing of thought using the brain and subsequently developed to obtain results. When there is a two-way interaction between the two dimensions, there is a process of selection and action to implement what is desired. Behavior is also a variable component to produce an action. Value is a dependent variable and the change of a value is influenced by the role of society, technology, political organization and also involves other cultural components.

In the context of the environment, the environment is defined as a value that suggests or supports actions that need to be taken on an ongoing basis towards care and responsibility for the environment. Stern proposed to make material things such as wealth as a necessary basis in the formation of environmental values but other views have seen that spiritual and religious practices are an indispensable basis for the formation of environmental values [35]. Environmental values have varying characteristics based on the differences in perspectives given by environmental researchers and scholars. Eagly and Kulesa have divided values into three categories namely egoistic, altruistic and biospheric [36]. Merchant has categorized environmental values into egocentric, homocentric and eco-centric [37].

Selfish value or egoinstrik is a value to talk about the well-being of an individual's life. Those who adhere to egoistic values are more concerned with economic activities that can provide maximum contribution to individuals [38]. This value also denies humans being the cause of negative effects in the environment [35]. Altruistic or homocentric values also emphasize human life as a whole. Thus, such values are more likely to say that the environment can benefit human life. Those who hold to these

values are more concerned with human life and all actions taken take into account the consequences that will occur in the environment [38]. All egoistic and homocentric values can be classified as anthropocentric values. All of these values tend to argue that the consequences that occur in the environment are due to human attitudes.

In connection with the new awareness, requires humans to devise an effective approach to address various environmental issues and problems. Abd Rahim has suggested that positive values towards conservation and preservation of the environment be nurtured and enhanced to provide awareness to individuals and society [39]. Caduta has suggested that several strategies be used to inculcate values into Environmental Education. Among them are by incorporating values directly into the curriculum, making value analysis, conducting screening on the values to be set and using strategies that can change human attitudes [40]. Environmental education was found to contribute significantly to the application of environmental values among students.

3.7 Practices towards the environment

Preservation and conservation of the environment must be inculcated to all levels of society continuously so that it becomes a continuous practice and becomes a culture of practice of a plural society in Malaysia. Therefore, the practice of environmental care needs to be inculcated from an early stage, namely the child stage. Therefore, the education system in Malaysia needs students to become Malaysians who truly practice sustainable culture in daily life [41]. According to Hafizah et al., school students have high knowledge but do not make it a practice in daily life [42]. It is very sad because they are the future heirs of the country. The government needs to have a more high impact approach as the environment is an important element in determining well-being and quality of life, yet the level of awareness to address the following problems is still at a low level [43].

3.8 Environmental management paradigm shift

In Table 5, it is clear that the government has taken various measures to address environmental problems over the past 20 years. Does it produce success? This measure is seen as still failing and still unable to address the problem of environmental pollution because most of the laws gazette before 1970 is sectorial in nature that only focuses on certain areas such as the Land Conservation Act 1960. So what is the next step to curb deterioration of environmental quality and inform the general public at large?

Table 5: Environmental Management Paradigm Shift

No.	Stages	Paradigm
1	Early Stage	19th century to 1974 (Environmental Quality Act passed by Parliament)
2	Second stage	1974 - 1987 The Environmental Impact Assessment (EIA Order) Order 1987 was gazetted
3	Third stage	Covers the period after 1987

If we look at the increase in technological progress today, the use of ICT is the best step to make the whole society aware from primary to adult. Juliana & Nur 'Aainaa stated that the media is a very important medium to disseminate information and apply knowledge to society [44]. This statement is supported by Siti Ezaleila and Azizah who said that in this modern era the use of new media such as facebook, print media, broadcast media and interpersonal media are very effective in imparting information and knowledge to the society [45]. This is because the mass media plays an important role in promoting environmental issues as an issue involving the well-being of the present and future generations [46]. This statement is supported by Govindaraju et al. who stressed that the mass media plays an important and necessary role, more proactive in creating community awareness, and trust to make the world greener and more environmentally friendly [47].

Findings from the results of the discussion indicate that metacognitive thinking and cognitive strategies will produce students who are able to find solutions in a given issue or problem. Apart from that, the motivation, attitude and positive values in the individual are able to minimize environmental pollution due to the inculcation of the value of responsibility in the self.

As has been discussed and explained above, it can be concluded that metacognitive thinking is a high level of thinking that can assist learners in their learning. Metacognitive thinking leads them to venture into their problems and solve them by multiple methods and metacognitive strategies (see Figure 6).

Students' creative thinking skills are themselves a motivation to the students in pursuing the subjects they study [48][49]. Teachers applying metacognitive strategies during their teaching and learning process develop the students the self-learning skills. These strategies are also motivating factors to students which would enable them to understand and to find answers to questions both in the teaching and learning program in and outside the classrooms [50][51].

In solving a problem, past experience creates an 'alert flow' which is passed to other information [52]. As in Figure 6, metacognitive thinking strategy is seen to be the best method of upgrading thinking skills. Students would generate solutions to problems they encounter through the process. Students would be able to generate creative and innovative ideas, not only this skill can generate solutions to problems but also as motivating factors [48][49]. The statement is clarified in the Figure 7 below.

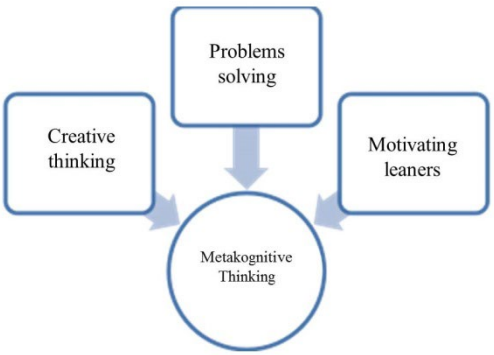

Figure 6: Metacognitive Thinking

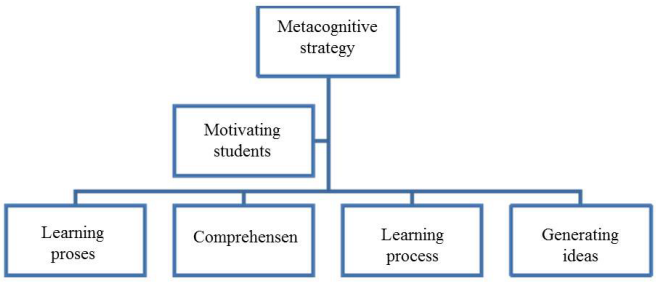

Figure 7: Metacognitive Strategy

As in Figure 7, metacognitive thinking strategy helps individual learners to develop their own learning process [53]. This thinking skill will be means of technically, education world has developed and progressed in line with the advent of technology in other fields of life. Thus, it is wise that education should concentrate on producing competent generations, skillful and efficient in facing challenging problems both mentally and physically [54]. Students with metacognitive thinking should be able to think critically and creatively. Their actions should be in accordance with their thinking. Only then can they mind their businesses, problems, conflicting ideas, and assignments competently as shown in Figure 8 [55].

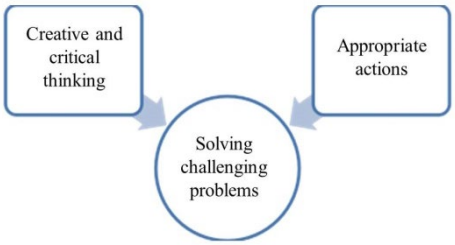

Figure 8: Metacognitive Thinking – Outcomes / Results

4. Conclusion

It can be concluded that metacognitive thinking skills amongst students would make them understand their subjects as exactly and precisely as they should be understood as shown in Figure 9 [56]. They are the outcomes resulted from teachers implementing metacognitive thinking strategies in their teaching and learning programs. It is hoped to maximize students' thinking capabilities and in all aspects, nurture higher level of thinking skill.

The positive impact of metacognitive thinking is that students should acquire all thinking skills. At the moment, those skills are critical and creative thinking skills. Other skills required are logical and reflection. All problems solving in all of forms and kinds for example, the level of difficulties and the nature of problems.

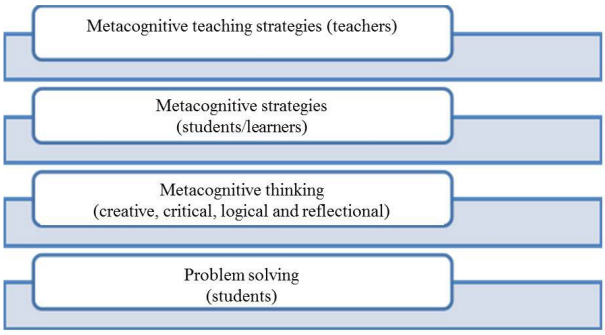

Figure 9: Metacognitive Teaching Strategies

Based on the discussion above it can be concluded that metacognitive thinking can change and transform students' minds from ordinary to a very smart level. Creative thinking as well as critical, innovative and analytical skills resulting from metacognitive strategies, in one way would be a form of motivation for students to face problems and their arising issues. Metacognitive strategies develop smart minds that can lead to very effective ways of solving problems once and for all. We are now living in a world without borders.

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