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Relationship between Environmental Awareness and Environmental Knowledge using "AKASA" Model among Architecture Students in private universities, Klang Valley, Malaysia.

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Abstract **The purpose of the study is to investigate correlation between environmental awareness and environmental knowledge using "AKASA" model which is the awareness, knowledge, attitude, skills and action for 2nd year and 3rd year of architecture undergraduate students from selected private university. The study intends to investigate the relationship of environmental literacy components specifically environmental awareness and environmental knowledge variables. The sample study comprises of 234 students from 5 selected private universities with questionnaires were used as instrument of survey. The parametric study was conducted with descriptive analysis and the results shows that the relationship between environmental awareness and environmental knowledge is positive and strongly related among year 2, year 3 and year 2 and year 3 combine.**

Keywords: environmental awareness, environmental knowledge, architecture students, private universities

I. INTRODUCTION

The current education system is not helping the global challenges towards nature and the current environmental crisis is reflecting on the current environmental education crisis. Universities worldwide are addressing the issue by integrating environmental literacy in the general education particularly in architecture schools. Architecture students are involved with the built environment whom are responsible to design in correspondence to the site context which deals with creating spaces for the community and using building materials for new ways of sustainable living. [1]

However, in Malaysian architectural courses, studies on environmental literacy in tertiary education are still scarce. The integration of environmental literacy into subject modules are at only surface level, resulting in mediocre outcomes for students. Learning framework in environmental studies and research in environmental literacy in architectural courses are being taken lightly and has not gone into the deeper depths of practice [2].

The study in [3], reveals the in-depth exposure to environmental literacy as the core general education requirements for all degrees. Student behaviour as such that they will apply the knowledge once graduated. Integrated courses will create students as better change agents and produce more active and effective citizenship. According to [4], the responsibilities of higher education as a means of systematically introducing new cohorts of architects to the values and practices of sustainable environmental design.

A. Research in Environmental Awareness

According to [5], a significant influence in education on students' environmental awareness and concern of children and teenagers in the Ranomafana region in Madagascar whereby student scores were prominently lower for environmental sensitivity compared to other affective variables which is intention to act and general environmental feelings. Environmental sensitivity has long been considered as a key predictor of responsible environmental behaviour [6]. Female environmental awareness was greater than male students, urban students' awareness is greater than rural students and local medium school students' awareness is greater than English medium students. Anyway general environmental awareness is still low level among the secondary school students in Kerala, India [7]. Research indicates that there is a significant relationship of education towards environmental awareness. Gender especially female, urban upbringing students and local medium school instead of English medium school seems to have significance towards environmental awareness. Environmental awareness also has significant relationship towards participation in environmental activities.

B. Research in Environmental Knowledge

According to [8], demographic differences such as gender and ethnicity influenced environmental knowledge in a survey in Kentucky, United States. The study revealed that comparatively respondents from urban-metro were more knowledgeable about global issues compared to urban-non-metro and rural-non-metro respondents. Influence of environmental knowledge and concluded that gender and ethnicity is significance whereby blacks and women are generally less knowledgeable in terms of environmental issues compared to whites and men [9]. Low level of environmental knowledge from 10th to 12th grade among high school students in national survey in United States [10].

As mentioned in [11], environmental knowledge of children is influenced by their immediate experiences and by the content of books they use in a study of elementary school students in Greece. There is a significant difference in environmental knowledge levels among the three groups of science education, biology and chemistry major students in Western University, United States [12]. There is a high level of environmental knowledge among their students at Michigan State University compared to the general public

[13]. The research in environmental knowledge indicates significance towards ethnicity and gender. Urban-metro white men respondents are more knowledgeable comparatively. Environmental knowledge is also influenced by student's immediate experiences and by the content of books they use in a study of elementary school students. Environmental knowledge levels also differ among groups of science education and it is higher among educated students compared to general public.

II. METHOD

The study intends to investigate correlation between environmental awareness and environmental knowledge using AKASA model among selected undergraduate students from 2nd year and 3rd year of architecture course from selected private university in Klang valley, Malaysia. The AKASA model were initiated during the Tbilisi Declaration in 1977 precedence to the Belgrade Charter in 1975. The UNESCO-UNEP commitment to the evolution of environmental education identified definitions of five essential components from which objectives in the environmental education should be targeted. This research paper only emphasizes on first 2 components which is environmental awareness and environmental knowledge.

The 5 selected private universities with a population size of 602 architecture students from year 2 and year 3 are accredited by Lembaga Akitek Malaysia (LAM) Part 1 and Malaysia Qualification Agency [14]. The survey questionnaire instrument on environmental awareness contains 15 questions and on environmental knowledge contains 25 questions in a five-point Likert-style scale where the number "5" indicate strongly agree response and "1" indicated the strongly disagree response. The questionnaire is divided into section A which question on demographic and background information and section B is on level of environmental awareness and environmental knowledge towards architectural studies.

Using proportion ratio method, the sample size were 234 architecture students from year 2 and year 3 from the selected 5 private universities. The pilot study with 50 questionnaires was tabulated with a Cronbach Alpha of 0.954, suggesting the items have relatively excellent reliability and internal consistency. Two PhD architecture senior lecturers validated the questionnaire before it was distributed to the study population. For the main study, descriptive analysis was used to gauge percentages mean variance and standard deviation. Since the study is parametric study, inferential statistics was used such as Pearson correlation.

The questions on Enviromental Awareness (EAw) were assessed based on level of sensitivity against certain environmental and ecological current problems which need to be addressed. By addressing the level of sensitivity whether students strongly disagree or strongly agree on certain statements of ecological and environmental issues, the level of awareness are gauged. The Cronbach alpha coefficient for environmental awareness is 0.914, suggesting that the items have relatively excellent reliability and internal consistency.

The questions on Environmental Knowledge (EKn) were mapped with subjects which are related to architectural environment such as building science, green design, sustainable energy, thermal comfort, visual comfort, acoustic comfort, recycle of building materials, air pollution and water pollution. The mapping of questions is relevant to the expected knowledge in their course of study whereby students were assessed based on capability to understand and assess the impact to society on the environment. The Cronbach alpha coefficient for environmental knowledge is 0.935, suggesting that the items have relatively excellent reliability and internal consistency. The overall Cronbach alpha coefficient for environmental literacy is 0.952.

A. Research Design

The existing curriculum in architecture is already intensive with large credits offered in major subjects [15]. The objective of architectural environmental education is to increase the sustainability of the building without compromising the site and human comfort. The goal of achieving sustainability in building comprises in threefold levels [16]. The first level is creating environmental awareness, the second level understanding building ecosystem and the third level is the ability to design sustainable buildings.

B. Level 1 - Creating Environmental Awareness

Environmental Awareness (EAw) refers to the sensitivity of individuals to the total environment and its allied problems. It simply means to be aware of what is wrong with our environment and to be aware of a way to make right and just decisions. To help social groups and individuals attain an awareness and sensitivity to the overall environment and its associated problems according to Tbilisi Declaration [17].

Environmental Literacy	Environmental Awareness		Environmental Knowledge		
Environmental Education in Architecture	aware & sensitive	make the right decision	capability of basic understanding	assess impact & consequences	Modules
Creating Environmental Awareness	•	•	•	•	Environmental Science
Understanding Building Ecosystems	•	•	•	•	Building Material
	•	•	•	•	Building Services
	•	•	•	•	Building Science
Ability to Design Sustainable Buildings	•	•	•	•	Environmental Design Integration

Figure 1: Environmental Awareness and Environmental Knowledge with Questionnaire Matrix

The module environmental sustainable design (ESD) objectives are for architecture students to develop awareness of local and global environmental issues and concerns, to explore the local context of climate and building practices and to explore the various approaches to sustainable architecture. Students are capable of identifying the related environmental concerns of local climatic conditions as per Figure 1 and utilizing strategies which will encourage effective local sustainable design principles and building practices.

C. Level 2 - Understanding Building Ecosystems

Understanding the building ecosystems is achieved by incorporating sustainability into core modules such as Building Science, Building Materials and Building Services. Student's ability in understanding the physics of building and responding to local climate conditions that reduces the energy load of mechanical air-conditioning systems. Students are capable to explain the effects of the sun on the thermal performance of buildings, including the effect of insulation, thermal mass and air movement. Infer how different building material's conductivity value, transmittance value and resistivity value has different effect on heat gain or thermal environment in a given space. Reference to Figure 1, students are able to estimate overall thermal transfer value in a space and to provide passive solutions for buildings which they design.

D. Level 3 - Ability to Design Sustainable Buildings

At this level, the ability to design sustainable buildings is implemented in the studio projects from the second to third year progressively in order to achieve LAM recognition of Part 1. The design work must be closely monitored and assessed on attempts to fulfil sustainable issues apart from other requirements such as Malaysian Green Building Index which conforms to MS1525:2007. Student's design are to be environmentally sustainable and well integrated with environmental strategies, conforming to building performance for instance thermal comfort, lighting, acoustic, conservation of water, appropriate building services systems, building material such as green materials, sustainable technology and construction methods while adhering in principle to regulatory uniform building by-laws (UBBL) and BOMBA fire regulations.

III. RESULTS

A. Descriptive Information of the Population Size, Sample Size, Year of Study, Gender and Age

The total population size (N) of year 2 and year 3 undergraduate architecture students is 602 in selected universities. Institution 1 is 42 students, institution 2 is 50 students, institution 3 is 48 students, institution 4 is 49 students and in institution 5 is 413 students. For each selected university, the sample size (S) is extracted based on proportion ratio method using the formula below.

$$\frac{\text{Total Architecture students in one University}}{\text{Total Population Size of All Universities}} \times \text{Total Sample Size}$$

The total sample size for year 2 is 114 (48.72%) and total sample size of year 3 is 120 (51.28%). Student's age ranges from 20 to 23 years old with mean age of 21.12. The total male sample size is 124 (53.00%) and the female sample size is 110 (47.00%). The selected universities have equal sample size number of year 2 and year 3 undergraduate architecture students, with well gender and mean age distribution. Normality test using Kolmogrov-Smirnov and Shapiro-Wilk and visual test using histogram, Q-Q plot and box plot. Both test results indicates the data is a little skewed and kurtotic but it does not differ significantly from normality. We can assume that the data are approximately normally distributed in terms of skewness and kurtosis.

B. Pearson Correlation Analysis

To determine relationship between environmental awareness and environmental knowledge, Table 1 shows the positive and negative interpretation of correlation coefficients.

Table 1: Interpretation of correlation coefficients ("r")

Range of correlation coefficients	Degree of correlation
0.80-1.00	very strong positive
0.60-0.79	strong positive
0.40-0.59	moderate positive
0.20-0.39	weak positive
0.00-0.19	very weak positive
0.00-(-0.19)	very weak negative
(-0.20)-(-0.39)	weak negative
(-0.40)-(-0.59)	moderate negative
(-0.60)-(-0.79)	strong negative
(-0.80)-(-1.00)	very strong negative

[18]

Table 2 shows, one hundred fourteen (114) students from year 2 were surveyed about their environmental awareness level (M=4.39, SD=.410) and environmental knowledge level (M=4.19, SD=.428). A Pearson's r data analysis revealed a significant strong positive correlation, r (112) = 0.637, p=0.000. Overall there was a strong positive significant correlation between environmental awareness and environmental knowledge. Increases in environmental awareness were correlated with increases in environmental knowledge.

Table 2: Correlations between Environmental Awareness and Environmental Knowledge Variables for Year 2

		EAw	EKn
Environmental	r	1	.637**
Awareness	p		.000
(EAw)	n		114

Table 3 shows, one hundred twenty (120) students from year 3 were surveyed about their environmental awareness level (*M*=4.24, *SD*=.604) and environmental knowledge level (*M*=4.09, *SD*=.569). A Pearson's r data analysis revealed a significant very strong positive correlation, r (118) = 0.901, p=0.000.

Table 3: Correlations between Environmental Awareness and Environmental Knowledge Variables for Year 3

		EAw	EKn
Environmental Awareness (EAw)	r	1	.901**
	p		.000
	n		120

Overall there was a very strong positive significant correlation between environmental awareness and environmental knowledge. Increases in environmental awareness were correlated with increases in environmental knowledge.

Table 4 shows, two hundred thirty-four (234) students from year 2 and year 3 combine were surveyed about their environmental awareness level (*M*=4.31, *SD*=.523) and environmental knowledge level (*M*=4.14, *SD*=.506). A Pearson's r data analysis revealed a significant very strong positive correlation, r (232) = 0.815, p=0.000.

Table 4: Correlations between Environmental Awareness and Environmental Knowledge Variables for Year 2 and Year 3 Combine

		EAw	EKn
Environmental Awareness (EAw)	r	1	.815**
	p		.000
	n		234

Overall there was a very strong positive significant correlation between environmental awareness and environmental knowledge. Increases in environmental awareness were correlated with increases in environmental knowledge.

IV. DISCUSSION

The study reveals, a strong positive significant correlation between environmental awareness and environmental knowledge for year 2 students but a very strong positive significant correlation for year 3 students and combined year 2 and year 3 architecture undergraduate students. The results indicate that the student's sensitivity to the total environment and its problems are at high level. Furthermore, the information on the environment gained from a variety of involvements to a basic understanding of its related problems is also at high level. Student's awareness and knowledge is demonstrated by reorganizing environmental issues as well as grasping the roots, implications and consequences of those problems. Student's learning outcome in the environmental subjects which are designed in the current context for undergraduate architecture students are more relevance towards environmental awareness and environmental knowledge which is in line with Blooms Taxonomy educational objectives. The high level of literacy in environmental awareness and environmental knowledge is also complimenting each other as correlation among them is also very strongly positive and significant especially year 3 students and combined year 2 and year 3.

This study is in congruent with [19], findings that the upper secondary students have high environmental awareness and have higher level of involvement in environmental activities in Tamil Nadu, India. Research in [20], observed that student's environmental knowledge is influenced by their immediate involvements and by the content of books they use in Greece. Furthermore, according to [21], study reveals that knowledge about the environment is at low level as compared to environmental awareness. It seems that awareness and students practice related to positive performance towards environment exist regardless of the lack of knowledge in and on environment. The study was conducted by WWF-Malaysia collaboration using 345 secondary schools.

In terms of literacy variables sequence ranking, combined year 2 and year 3 reveals a sequence ranking of awareness, knowledge, attitude, skill and action which is in congruent with "AKASA' sequence and considered to be from the simplest to the more complex, interdependent, and must be achieved one step at a time [22]. Individuals' environmental awareness is molded by their knowledge, attitude and interrelationships among its components [23]. Correlation between environmental awareness (EAw) and environmental knowledge (EKn) are positively stronger at year 3 and combined year 2 and year 3 which reveals that the number of years and the amount of architecture and environmental subjects the students exposed at higher years are an influencing factor in the student's environmental knowledge. This study is congruent to [24], which indicates students towards the completion of their studies described increased participation in most of the study's environmental behavior categories as compared to the beginning.

V. CONCLUSIONS

This study concludes that the relationship between environmental awareness and environmental knowledge are significantly positive and strong. It indicates that, Lembaga Arkitek Malaysia (LAM) established, Council of Accreditation and Architectural Education Malaysia (CAAEM) which regulates and recognizes all matters relating to architectural education has its own set of criteria for architecture education and graduates for schools to meet. It's also concludes that the environmental awareness and environmental knowledge thinking are not being taken lightly and has gone into deeper depths of learning framework and practice. This supports the Malaysian architectural education accreditation body which sets "a satisfactory balance between theory and practice" as its first qualitative standards. In terms of the anticipated scope of

competencies that an architecture student needs to attain and identifies design capabilities, knowledge, and skills to accomplish an architect's role as generalists who can co-ordinate interdisciplinary objectives. The council also endorses teaching based on project realization as the principle teaching method. This approach places students under the direct and personal guidance of lecturers. This method provides "a synthesis of knowledge, aptitudes, and attitudes" [25].

As study limitations, many research in environmental education are programme specific and the literatures are from various different culture which is difficult for comparisons. Variety of assessment tool frameworks make it challenging to compare and integrate study results across programs. The curriculum in architectural undergraduate programme can be focused towards sustainability especially by integrating in early stages in first year itself. Non-technological courses should be incorporated with more environmental content as this can form the attitude towards environmental concern. For future research, individual variables can be measured independently and longitudinal study can be surveyed for comparison purpose. Environmental literacy based on gender comparison, student's background such as ethnicity, rural vs. metro and also environmental literacy based on different university faculties can be conducted.

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