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The state of green computing knowledge among students in a Malaysian public university

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ABSTRACT: This article reports on a study undertaken to explore the state of Malaysian university students' knowledge of green computing. Two types of knowledge were assessed, i.e. *subjective* knowledge and *objective* knowledge. The study also sought to ascertain the influence of gender and field of study on the two types of knowledge, and whether they were positively and significantly correlated. A total of 208 students from ICT- and non-ICT study programmes of a Malaysian public university took the survey. Data were collected using a self-developed green computing questionnaire. Descriptive statistics, independent-samples *t*-tests and bivariate correlation were employed to analyze the data. Results show a general lack of knowledge on various aspects of green computing, particularly with respect to Energy Star, E-PEAT, Malaysia Green Techology Policy, printer types and energy consumption, energy-efficient practices and hazardous chemicals present in computers. Gender influenced perceived knowledge – with female students reporting significantly higher knowledge levels – but not objective knowledge, while field of study influenced both in favor of students pursuing ICT-related degree programmes. A significant positive correlation was discovered between the two types of knowledge. The results suggest a strong need for green computing education to be initiated across Malaysian university campuses.

1 INTRODUCTION

Green computing knowledge is fundamental to sustaining a green environment. Laroche, Tomiuk, Bergeron, and Barbaro-Forleo (2002) voiced this idea about a decade ago by stating that knowledge holds the key to the formation of environmentally proactive attitudes. Much earlier on McDougall (1993) maintained that consumer environmental knowledge is the key to driving the green movement. Murugesan (2008) defined green computing as "the study and practice of designing, manufacturing, using and disposing of computers, servers, and associated subsystems, such as monitors, printers, storage devices, and networking and communication systems, efficiently and effectively with minimal or no impact on the environment" (pp. 25–26). Green computing covers the broad scope of energy-efficient and hazard-free computing; energy-efficient in that it promotes computing activities and use of resources that consume only the necessary amount of electricity and generate the least amount of carbon emission into the atmosphere; and hazard-free in that it advocates the use and disposal of computing resources in responsible and non-harmful ways to the user and the environment. In layman terms, green computing can be more simply described as the energy-efficient and environmentally responsible use of computers and all the resources associated with them, digital or non-digital.

The adoption of green computing necessitates that ICT users be informed about the various facets of the notion, i.e. what it is that constitutes environmentally sustainable computing, what features and characteristics make a computer a green PC, and what computing practices are compliant with the green movement. As purported by Rogers (2003), knowledge is the first step in the adoption process. An individual cannot begin the adoption process without knowing about the idea, the practice or the device to be adopted. Therefore, the importance of knowledge in embracing green computing ideas cannot be overstated. A lack of knowledge in energy-efficient computing has in fact already led to much energy wastage and financial loss around the globe. According to Jenkin, Webster, and McShane (2011), half of the world's energy wastage is attributable to uninformed behaviours of users and consumers.

User groups, which include university students, must be adequately informed and educated about environmentally sustainable computing, as they largely determine the success of the green movement and green initiatives. University students around the world form a huge segment of ICT users. They are part of the group responsible for the 2% global carbon emission attributed to computing activities (Boccaletti, Löffler, & Oppenheim, 2008). In today's higher education context, virtually every aspect of learning and scholarship is influenced or shaped by ICT, and students will spend most of their adult lives in a technology-driven world. As such, they must be equipped with the knowledge to use ICT effectively (Tyler, 2005), as well as to use it in responsible and

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eco-friendly ways. It must be emphasized that ICT literacy should be complemented with environmental literacy in relation to computer use. Much research informs us about the development of students' ICT literacy over the years – how they have moved from being digital immigrants to digital natives (e.g. Jones, Harmon, & O'Grady-Jones, 2005), but there is little information available to tell us about their environmental literacy in relation to ICT use. This study, therefore, was an attempt to fill this gap in the literature by looking into the state of students' knowledge about the relationship between their computer use and its resulting impact on the environment.

2 RESEARCH OBJECTIVES

The study, hence, set out to address the following objectives:

1. to explore the levels of green computing knowledge among students in a Malaysian public university by identifying whether they were knowledgeable with its core vocabulary, basic ideas and important facts;
2. to examine the influences of gender and field of study on university students' perceived and objective knowledge of green computing; and
3. to establish the relationship between perceived knowledge and objective knowledge of green computing.

3 LITERATURE REVIEW

3.1 *Objective and perceived knowledge*

Knowledge is defined as the amount of information held in the memory that affects the way individuals assess, interpret and react to the stimuli around them (Blackwell, Miniard, & Engel, 2001). Brucks (1985) provided a categorization of knowledge that is particularly useful to this study, breaking the construct down to subjective and objective types. Subjective knowledge is an individual's perception or self-assessment of what and how much he or she knows about a subject. It is also called perceived or self-assessed knowledge. Objective knowledge refers to accurate factual information stored in the memory. In brief, perceived or subjective knowledge reflects what individuals think they know about a subject, while objective knowledge is a measure of what they actually know about it. According to Radecki and Jaccard (1995), what individuals believe they know is a function of what they actually do know. In fact, some research has shown this presumption to be empirically valid. Brucks (1985) found a significant positive correlation of 0.54 between objective and subjective knowledge, while Carlson, Vincent, Hardesty, and Bearden (2009) found a medium-sized correlation of 0.37. Thus, it is reasonable to expect the measures of objective knowledge to be positively related with perceptions of subjective knowledge. The relationship between these two types of knowledge is important as it provides a measure to estimate an individual's acceptance of a new idea (Boccaletti & Moro, 2000), such as green computing.

3.2 *Knowledge and green computing*

A number of surveys show that a lack of knowledge is the biggest barrier to the adoption of green computing practices and solutions in the IT industry, and that this state of ignorance is a cause for worry as it impacts a country's economic recovery via reduced energy consumption and prevention of wasteful spending. Courtney (2008) asserted that a lack of knowledge in green IT is preventing IT managers from going green. A survey of 120 IT decision-makers carried out in the UK revealed that only 18% of the managers evaluated the carbon footprint of a new IT system prior to its purchase, and nearly half did not consider the environmental impact of IT equipment. Many did not even know what the requirements were for purchasing green systems for their companies and had completely no knowledge of green computing by which to judge the green products promoted in the market. This ignorance about green IT was cited as the key obstacle in the adoption of green practices among IT managers in the UK. Another UK survey conducted by Nlyte.Software revealed the following statistics: 63% of businesses accused consumers of being unaware of the hefty carbon footprint associated with the use of Internet services, from Hotmail to Amazon and Facebook, yet 53% of these businesses themselves had no inkling of the environmental impact of their own data centres; only 25% of ICT users aged 16 to 64 claimed to understand the vast environmental impact of their carbon footprint, while just a fraction (2%) of heavy users aged 16 to 24 would consider paying for online services to offset their carbon emissions; a staggering 83% of Facebook and email users had no idea where their thousands of photos and multiple accounts are stored (Nlyte.Software, 2010). In Australia, a 2011 readers' poll disclosed an apparent lack of knowledge in green IT among organisations, with 25% admitting having no knowledge of what it means and 22% claiming that their organisation did not know enough about green technologies to adopt green computing (Government News, 2011). The statistics suggest that although a lot of users feel it is desirable to go green, many do not know much about what it really is and what is going on, nor do they understand why there is a need to go green.

3.3 *University students and green computing knowledge*

We have reasons to suspect that the same situation might prevail among students in universities, looking at how uncaring they are and have been with energy consumption. Reports abound that most students leave their computers on the whole day. Pearce (2001) reported that the majority of students at an American university never shut down their computers and were ignorant of the implications of their

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energy waste, while Creighton (2002) discovered a shocking 80% to be engaged in this habit of leaving their computers on all the time. In a more recent study, Dookhitram, Narsoo, Sunhaloo, Sukhoo, and Soobron (2012) found only 18% of students in a technology university in Mauritus were conscious of wastage and turned off their computers when not in use. As observed by Pearce (2001) and Batlegang (2012), college students are generally oblivious to the negative impacts of computers, and have limited or no knowledge on basic issues of green computing, such as energy-saving techniques of using computing resources. Dookhitram et al. (2012) studied the level of green computing knowledge among students pursuing ICT-related degree programmes and found it to be moderate. But the authors also discovered a widespread misperception to prevail among them, such as in believing that screen savers actually function to save energy. Although 80% of the students were reported to have a correct understanding of green computing, their practices however did not reflect this understanding.

Raza, Patle, and Arya (2012) proposed the idea of teaching users to understand how power consumption impacts the "greenness" of any technology, believing it to be an essential step toward reducing wasteful energy consumption. Efforts to educate the young generation through educational programmes in schools and universities are already under way in the U.S., Hong Kong, India, parts of Europe, and the U.K. (Murugesan, 2013). Educational institutions – from elementary schools to universities – in Hong Kong, Macao and mainland China have incorporated environmental protection and green concepts into their course syllabi, focusing on fundamental green issues such as nonrenewable energy sources and materials, and climate change among other things. Malaysia is lagging far behind in this sense. Among Malaysians, some consciousness does exist on the need to go green, but unfortunately it has not translated into actual initiatives, plans or efforts to increase knowledge and awareness in it (Raj, 2008). Looking at the general lack of knowledge and practices in environmental sustainability, a very recent study in Malaysia has called for an investigation into the state of awareness and knowledge on sustaining a green environment among Malaysians (Afroz, Masud, Akhtar, & Duasa, 2013).

Studies looking *specifically* at students' green computing knowledge are extremely rare. There is an acute lack of research in this area although students represent a substantial portion of ICT users worldwide and can play a significant role as agents of global CO_2 reduction. Research in green computing has mainly focused on solutions and practices for the IT industry and businesses, and has largely neglected the importance of examining what end users, especially students in universities and colleges, know about green computing and whether they engage in green compliant behaviours. Our study was an attempt to address this gap in the green computing literature.

4 METHODOLOGY

4.1 *Measurement of knowledge*

Knowledge is the amount of information held in a person's memory (Blackwell et al., 2001). In this study, we measured students' knowledge of green computing in two ways, subjectively and objectively. *Subjective* or *perceived* knowledge, which refers to what students think they know about green computing, was assessed through eight Likert items that required students to assess the levels of their knowledge of green computing vocabulary on a 5-point scale from *High* to *None*. *Objective* knowledge, defined as what students actually and correctly know about green computing, was assessed through sixteen (16) True-False items on various aspects of environmentally sustainable computing.

4.2 *Sample*

Two-hundred and eight ($N = 208$) university students from a Malaysian public university took part in the survey. They were randomly and purposively sampled from its nine faculties, and comprised an equal number of males ($n = 104$) and females ($n = 104$). The portion representing the ICT group was 46.6% ($n = 97$), purposively sampled from two main faculties offering ICT-related degree programmes, i.e. the Faculty of Engineering and the Faculty of Information and Communications Technology (ICT). The ICT group consisted of students pursuing various ICT-based degrees in Computer and Information Engineering, Software Engineering, Computer Science, Information Technology and Multimedia, and Computer-Aided Design and Drawing. The non-ICT group constituted 53.4% ($n = 111$) of the total sample, randomly selected from faculties and departments not dealing specifically with ICT-related studies, such as Psychology, Sociology, Political Science, Economics, Management Sciences, Religion, Education and English Language. All of the students were computer literate with a computer experience ranging between 10 and 20 years.

4.3 *Instrument*

The study utilised a self-developed green computing questionnaire with 3 sections. Section A contained demographic items requesting details about gender, faculty, field of study (ICT-related or non-ICT related) and computer experience. Section B contained eight (8) Likert-type items that requested students to rate their knowledge levels of the following terms and ideas: *"green computing"*, *"green PC"*, *"carbon footprint"*, *"carbon-free computing"*, *"e-waste"*, *"Energy Star"*, *"E-PEAT"*, and *"Malaysia Green Technology Policy."* The response categories used were *"High"*, *"Quite High"*, *"Moderate"*, *"Low"* and *"None."* Section C contained sixteen (16) True-False items assessing students' objective knowledge of green computing. A third option, *"I Don't Know"*, was provided to reduce guessing and getting the correct answer by chance. The items were validated by a panel of experts for green computing content and psychometric properties. They were pilot tested and improved upon prior to the actual data collection. The internal consistency of the data derived from the eight perceived knowledge items was Cronbach's alpha $\alpha = 0.93$, while that drawn from the sixteen objective knowledge items was $\alpha = 0.79$.

5 DATA COLLECTION AND ANALYSIS

5.1 *Data collection*

Data were collected through three different means. First in the Faculties of Engineering and ICT, we approached a number of lecturers to help us administer the questionnaires in class. Students filled them out on the spot and returned them after class. This method had ensured quite a good response rate from the ICT group. Second we sent out emails with the questionnaire attached to a pool of students randomly identified from the name lists given by departments and faculties. Third we approached students individually and invited them to participate. This was done with the help of student research assistants. We made phone calls and sent e-mail reminders and text messages to encourage greater participation in the survey. A total of 208 usable questionnaires were returned, constituting a response rate of about 69%.

5.2 *Data analysis*

Analysis of the data involved a combination of descriptive statistics (i.e. percentages and frequency counts), independent-samples t-tests, and bivariate correlation, each addressing research objectives one, two and three respectively. To check for the influences of gender and field of study, two sets of independent-samples t-test were run on the mean scores for perceived knowledge (computed from responses to the eight Likert-type items) and objective knowledge. The latter was drawn from students' responses to the sixteen True-False items, which were graded and given a score, i.e. 1 for each correct answer and 0 for each wrong and I-don't-know response. The scores were then summated, yielding a group score each for males and females, and for ICT and non-ICT students. A bivariate correlation procedure using the Pearson product-moment coefficient was run between the scores of perceived and objective knowledge to establish if the two measures were significantly and positively correlated.

6 RESULTS

6.1 *Perceived knowledge of green computing*

Figure 1 shows students' assessment of their green computing knowledge on the five levels indicated, i.e. ***"High"***, *"Quite High"*, *"Moderate"*, *"Low"* and *"None."* It is interesting to see the very high percentages of students reporting to have zero knowledge

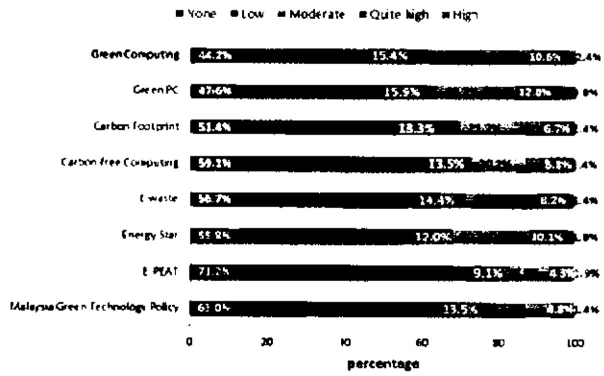

Figure 1. University Students' Perceived Knowledge of Green Computing ($N = 208$).

Table 1. Influence of Gender and Field of Study on Students' Perceived Knowledge of Green Computing: A Summary of Independent Samples t-Test Results ($N = 208$).

Respondents	n	df	M	SD	t	p-value
Gender						
Male	104	206	5.85	6.19	−2.026	0.04*
Female	104		7.88	8.12		
Field of Study						
ICT	97	206	10.75	7.86	8.316	0.001*
Non-ICT	111		3.46	4.54		

*Significant at $p < 0.05$.

of the eight green computing terms and ideas asked. These percentages ranged from the lowest of 44.2% (on the idea of *green computing* itself) to the highest of 71.2% (on the item *E-PEAT*).

Collectively, between 59.6% and 80.3% perceived knowing little or nothing at all about the green computing ideas in question. In descending order, the ideas not known to the great majority of students were *E-PEAT* with 80.3% of students reporting having little and no knowledge of, followed by *Malaysia Green Technology* with 76.4%, *carbon-free computing* with 72.6%, *e-waste* with 71.2%, *carbon footprint* with 69.7%, *green PC* with 63.5% and *green computing* with 59.6%. In all of these items, percentages that reported high and quite high levels of knowledge were very small from 6.3% (on *E-PEAT* and *Malaysia Green Technology*) to 15.9% (on *green PC*). The results reveal that a great majority of Malaysian university students perceived having a lack of knowledge in green computing aspects.

The responses to the perceived knowledge items were summated and subjected to two independent-samples t-tests to check for the influences of gender and field of study. The results are presented in Table 1.

Females reported significantly higher levels of green computing knowledge (M = 7.88, SD = 8.12) than males (M = 5.85, SD = 6.19) by 2.03 points. The difference was statistically significant, [$t(206) = -2.026$, $p = 0.04$], but in terms of practical importance, it is considered small at Cohen's effect size of

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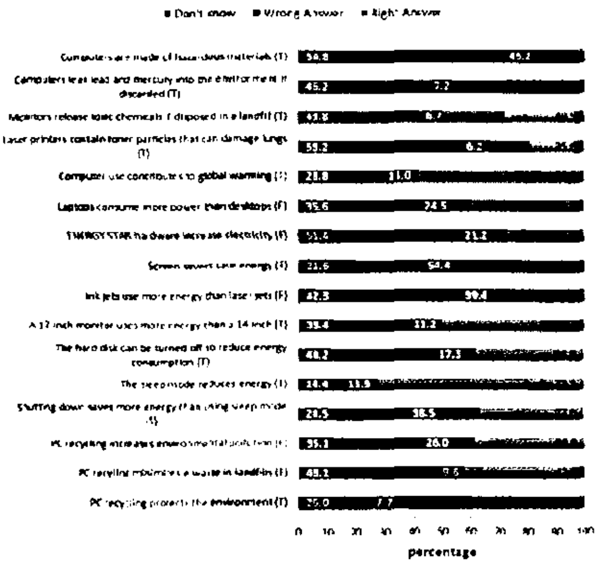

Figure 2. University Students' Objective Knowledge of Green Computing ($N = 208$).

$d = 0.28$, just slightly exceeding the threshold of 0.20 for small effect sizes. The influence of field of study was also statistically significant, [$t(206) = 8.316$, $p = 0.001$], in favour of students from the ICT background (M = 10.75, SD = 3.46). The non-ICT group perceived significantly lower levels of knowledge (M = 3.46, SD = 4.54), falling behind by 7.29 points. The difference accounted for an effect size of Cohen's $d = 1.14$, which exceeded the threshold of 0.8 for large effect sizes specified by Cohen (1988), and is therefore considered large in terms of practical importance.

6.2 *Objective knowledge of green computing*

Students' performance on the True-False items depicting their objective knowledge of green computing is shown in Figure 2. Of particular interest are the proportions of students clearly indicating no knowledge of all the items in question. These ranged from 14.4% (on the item "*Sleep mode reduces energy*") to 58.2% (on the item "*Laser printers contain toner particles that can damage lungs*"). Four items stood out as the most "problematic," meaning that few students provided the right answers to them indicating that most were ignorant of the issues posed. These four items had more than 70% total incorrect responses when wrong and *I-don't-know* answers were combined. The four items were "*Computers are made from hazardous material*" (with 100% incorrect responses), "*Inkjets use more energy than laser jets*" (a total of 81.7% incorrect responses), "*Screen savers save energy*" (76% total incorrect responses) and "*Energy Star hardware increase electricity*" (72.6% total incorrect responses). These percentages are acute indicators that Malaysian university students lacked knowledge of the Energy Star certification, the materials used to manufacture computers, energy consumption between inkjet and laser jet printers, and the actual nature of screen savers.

Computer users often have the misperception that screen savers save energy when in reality they don't. This misperception was detected among the sample in the study when 54.4% ($n = 113$) responded incorrectly believing that using screen savers saves energy. Only 24% ($n = 50$) gave the right response to this statement, while 21.6% ($n = 45$) indicated no knowledge. As regards the energy consumption between laser jets and inkjets, it is likely that many did not know the difference between the two. If this was truly the case, then checking *True* as the answer would be as good as checking *False* or the *I-don't-know* option. A close inspection of students' responses reveals that for every item, subtsantially more of the incorrect and *I-don't-know* responses were provided by non-ICT students. In terms of gender, the distribution of incorrect and *I-don't-know* answers was about equal across male and female groups with very marginal gaps.

A good majority of students appeared knowledgeable about the function of the sleep mode in reducing energy consumption by computers (72.1% correct answers), the role of PC recycling in protecting the environment (66.3% correct answers), and the fact that using computers contributes to global warming (58.2% correct answers). In addition, about half were rightly informed about larger-sized monitors consuming more electricity than smaller-sized screens (50.4% correct answers), monitors releasing toxic chemicals if disposed in a landfill (49.5% correct answers), and computers leaking harmful chemicals into the environment if inappropriately disposed of (46.6% correct answers). The remaining items saw between 35.6% (*Laser printers contain toner particles that can damage lungs*) and 42.3% (*PC recycling minimizes e-waste in landfills*) correct answers.

However, we detected a peculiarity in the pattern of answers to the first item (*"Computers are made of hazardous material"*) when examined against the responses to two other related statements (e.g. "*Computers leak lead and mercury into the environment if discarded*" and "*Monitors release toxic chemicals if disposed in a landfill*"). It is perplexing that none had correctly identified this statement to be true (45.2% wrong responses and 54.8% no knowledge); yet of the same pool of students, 46.6% ($n = 97$) and 49.5% ($n = 103$) respectively had affirmed quite correctly that computers leak hazardous chemicals like lead and mercury into the environment, and that monitors release toxic chemicals if disposed in landfills. We found it odd that the same students who were able to correctly affirm the latter two facts about hazardous chemicals being present in computers and monitors actually failed to recognize that harmful substances are indeed used to manufacture computers. The results are confounding and show inconsistent knowledge and belief patterns among the students.

The same inconsistencies were also found for the items "*PC recycling protects the environment*" (66.3% correct answers), "*PC recycling minimizes e-waste in landfills*" (42.3% correct answers) and "*PC recycling increases environmental pollution*" (38.9% correct

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Table 2. Influence of Gender and Field of Study on Students' Objective Knowledge of Green Computing: A Summary of Independent Samples t-Test Results ($N = 208$).

Respondents	n	df	M	SD	t	*p*-value
Gender						
Male	104	206	7.47	3.74	−.184	.854*
Female	104		7.57	3.78		
Field of Study						
ICT	97	206	9.21	3.28	6.660	.001**
Non-ICT	111		6.05	3.53		

*not significant at $p > 0.05$; **significant at $p < 0.05$.

answers). One would expect the same 66.3%, or a percentage close to it, to give correct responses to the latter two items, but instead, the portions of correct responses for PC recycling minimizing e-waste and increasing environmental pollution saw a substantial reduction of 24% and 27.4% respectively. What this possibly means is that between 24% and 27.4% of students were inconsistent or unsure about their knowledge of PC recycling and its relationship to environmental protection. Similarly about 35% were unsure whether it is more energy efficient to turn off the computer when not in use or to turn on the sleep mode. This likelihood of uncertainty was detected in the difference in the correct answers provided for *"Shutting down saves more energy than using the sleep mode"* (37% correct answers) and *"The sleep mode reduces energy"* (72.1% correct answers).

An independent-samples *t*-test performed on the mean scores shows a lack of gender influence on students' objective knowledge of green computing, but a statistically significant effect of field of study. The results are tabulated in Table 2.

Although female students obtained a slight higher mean score (M = 7.57, SD = 3.78) on the objective green computing test than did their male counterparts (M = 7.47, SD = 3.74), the difference in the groups' mean scores was slight and not statistically significant, [$t(206) = -.184$, $p = 0.854$]. This shows that male and female university students were about equal in their objective knowledge of green computing. On the other hand, field of study exercised an influence in the test performance in favor of the group doing ICT-related academic programmes (M = 9.21, SD = 3.28). The mean score difference of 3.16 points between the ICT and non-ICT group was statistically significant at [$t(206) = 6.660$, $p = 0.001$], and accounted for an effect size of Cohen's $d = 1.20$, which is considered large and practically important. The results point to a strong influence of ICT-related education on knowledge of green computing.

6.3 *Relationship between perceived and objective knowledge*

A bivariate correlation is a measurement of the strength of the relationship between two variables. In this study, we measured the strength of relationship between perceived knowledge and objective knowledge. The bivariate correlation procedure using Pearson product-moment coefficient run between the two types of knowledge produced statistically significant results in the positive direction, at $r = 0.53$, $p = 0.001$. The results indicated a statistically reliable association between perceived and objective knowledge; they were found to be positively related. In addition, the magnitude of the linear relationship was strong. What this means is students with greater objective knowledge tend to report higher levels of perceived knowledge. In this case, it is reasonable to conclude that perceived knowledge can be used as a proxy for actual knowledge of green computing.

7 DISCUSSION

A number of interesting findings emerged from our study. First, our presumption that university students lacked knowledge in green computing was confirmed. The results indicate that a majority of the students surveyed had little or no idea at all of green computing and most aspects associated with it. Only a few aspects showed a clear majority of students having some knowledge of, and these aspects were: the function of the sleep mode, the role of PC recycling in protecting the environment, and the relationship between computer use and global warming. In contrast, significant numbers were ignorant of the following ideas: which printer type (inkjet or laser jet) consumes less energy, the Energy Star and E-PEAT certifications, Malaysia Green Technology Policy, ways of saving energy in relation to computer use, and the hazardous chemicals present in computers. Second, most students also had a misperception regarding screen savers, thinking that it functions to reduce energy consumption. This finding is consistent with Dookhitram et al. (2012). Third, our results were confounded by inconsistent knowledge and belief patterns that emerged in the responses to certain items in the True-False test, which suggests that uncertainty rather than certainty characterized students' objective knowledge of green computing. Further research employing multiple ways of looking into objective knowledge of green computing is needed to clarify this issue.

Fourth, gender influenced perceived knowledge but not objective knowledge. Although females perceived having significantly higher levels of knowledge but objectively, they were at par with males in green ICT knowledge. It should be noted, however, that the effect size of the difference between male and female perceptions was small. Fifth, field of study exerted a consistently significant influence on both perceived and objective knowledge, in favour of ICT-educated students. The pattern implies the importance of ICT-based education in raising students' knowledge in environmentally sustainable computing. Finally, perceived knowledge was significantly and positively correlated with objective knowledge, corroborating

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earlier stipulations that the former is a function of the latter (Radecki & Jaccard, 1995). The correlation coefficient of $r = 0.53$ suggests a strong positive correlation between the two types of knowledge and approximated the strength of relationship found in Brucks (1985). Future research should look into how these two types of knowledge affect students' practices of green computing and their intention to embrace the idea.

Our findings have shed important light on the state of green computing knowledge among university students, particularly in the Malaysian higher education context. The results emphasize an urgent need to start an education process aimed at pursuing sustainability goals across Malaysian university campuses. Students on today's campuses literally live electronically. Every aspect of their lives is influenced by the computer, be it registering for courses, downloading and accessing learning materials, keeping in touch with friends and relatives through social networking sites, completing assignments, paying fees and bills, and keeping themselves entertained. The sheer vast of their computer- and Internet-dependent activities is bound to increase global carbon emissions, much of which may be unnecessary considering the state of their ignorance about energy-efficient computing. Using multiple means to teach students about environmentally sustainable computing is perhaps the most feasible way of reducing campus-wide carbon footprint that threatens to further aggravate the already pressing issue of global warming.

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