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Exploring the Energy-Saving and Carbon Reduction Literacy of Restaurant Employees

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1. Introduction

In the era of industrial and commercial advancement, the comprehensive and cross-national impact on the safety of life, ecology, socio-economic well being, health, disease quarantine, waste, or food safety has become a major global issue (e.g., Heaton, 2010). Currently, environmentally sustainable issues and ecological literacy are more important than ever, and environment education has emerged to teach the relationships and interactions between natural and human systems (Goudie, 2008; Stapp, 1998). Company actions to implement sustainable management solutions implicitly assume that managers and employees are aware of the corporate sustainability policies and procedures. However, the assumption can be a leap of faith—many employees may be unaware of sustainability issues beyond their work responsibilities. As a result, we still need to explore how technical, action, and social learning can be used by large corporations to embed sustainability across the organization (Haugh & Talwar, 2010).

Food production has a wide range of sustainability implications, including changes in global biogeochemical processes, such as water consumption (Hoekstra & Chapagain, 2007). Meanwhile, the food service contributes to the global emissions of greenhouse gases (GHGs) relating to agriculture, food processing, transportation, and meal preparation. Food consumption is widely recognized as an important part of the tourism experience (e.g., Hjalanger & Richards, 2002). From the view of sustainable tourism research, consumers are attaching an increasing importance to tourism, whereas restaurant service is an industry that has become an essential part of people's lives (Leslie, 2007). Given that restaurants interact intimately with consumers in the service, the industry plays a significant role in tourism. As a result, the energy and environmental pollution issues of restaurants have become important.

The energy and environmental pollution issues of restaurants have not been adequately studied. The literature on the relationship between restaurant management and environment change is sparse (e.g., Gössling et al., 2011). From the supply and demand perspective, operators, employees, and consumers now have increased awareness of energy conservation and carbon reduction issues. However, the right knowledge is needed so that energy conservation and carbon reduction emissions actions can be implemented to allow the tourism hospitality industry to attain sustainable operations. This is the reason why the environment and eco-related literacy issues are increasingly becoming more important these days (e.g., Balgopal & Wallace, 2009).

Food services provided by restaurants in the global hospitality industry are highly homogeneous, making competition fierce. Although restaurants could enhance sales through marketing, the depletion of food ingredients and energy is projected to reach 50% in the next few decades (Blas, 2007). In terms of the overall work environment, despite the gloomy economic forecast, the injection of human capital, including personnel cost and productivity, is essential. The restaurant industry also faces intensified competition and the challenges of sustainable management (Department for Environment, Food and Rural Affairs, 2007). In Taiwan, an island of scarce energy reserves, massive volumes of greenhouse gases are produced each year due to the large fossil fuel consumption. In 2007, CO₂ emissions from energy use totaled 276.18 million tons, or 0.95% of the world consumption; CO₂ emission per capita volume was 12.08 tons. These figures are among the highest in the world (International Energy Agency, 2009). Currently, energy efficiency and carbon emission reduction are Taiwanese government's important policies.

Organizational learning, change mechanisms, and literacy can assist the holistic understanding of sustainability knowledge and practice (e.g., Benn & Martin, 2010). Developing ESCR literacy contents for environment and hospitality education programs and/or the reward eligibility criteria of hospitality industry and education is a challenging task that needs improvement. To build on prior research and to promote and implement ESCR practices effectively such as energy saving and carbon reduction in the hospitality tourism industry, the current study aimed to explore restaurant employees' ESCR literacy content, especially regarding energy saving and carbon reduction in Taiwan.

2. Literature information

2.1 Corporate social responsibility in the restaurant environment

The Earth's resources are limited and competition is global; hence, environmental issues have become important. Raising the social responsibility of businesses is an inevitable trend. Both consumers and investors are beginning to see more clearly the relationship between business performance and environmental quality (Bansal & Roth, 2000; Chung & Parker, 2010; Scanlon, 2007).

Berry and Rondinelli (1998) noted that progressive corporations are now looking at environmental performance from a far different perspective than they did a decade ago. Beyond complying with increasingly more stringent regulations, they must protect or enhance their ethical images, avoid serious legal liabilities, and satisfy the safety concerns of employees. For the tourism, hotel, and food and beverage service industry, the competition for scarce resources such as clean water, energy, and arable land will intensify in the face of global warming and an expanding global population (Dubois & Ceron, 2006; Tip, 2009).

Learning what we can do now to conserve resources and acting on that information is critical for the future sustainability of the food system (American Dietetic Association, 2007).

The hospitality and tourism industry is under pressure to become more environmentally friendly. Therefore, restaurant operators will begin to focus on social responsibility, the concept of industrial ecology, and environmental management issues (Burstrom & Korhonen, 2001, García Rodríguez & del Mar Armas Cruz, 2007; Manaktola & Jauhari, 2007). For example, according to American Yum! Brands, Inc.'s first corporate-responsibility report, the company is stepping up efforts to lower its carbon footprint and operate more eco-friendly restaurants. The report also stated that Yum is attempting to reduce its worldwide environmental impact by implementing equipment retrofits and energy-efficient innovations, employing better energy and waste management systems, and recycling paper and other packaging.

2.2 Energy saving, carbon reduction, and literacy in the restaurant industry

There is growing recognition of the rapidly increasing impact of green, energy saving, carbon reduction, and the importance of sustainability (e.g., Laing & Frost, 2010). The Green Restaurant Association (GRA), a non-profit organization that helps food service operations become more environmentally sustainable (GRA, 2010), has been building the world's largest database of environmental solutions for the restaurant industry since 1990. The association believes restaurants should adopt safety, health, and environmental protection concepts, use energy and resources efficiently and economically, utilize organic ingredients and environmentally friendly products (such as environmental protection tableware), and use non-toxic and environmental-friendly building materials and cleaning products. According to Manaktola and Jauhari (2007), a green hotel and restaurant is a term that refers to a lodging establishment that has made a commitment to various ecologically sound and green practices, such as saving water, conserving energy, and reducing solid waste (www.hometravelagency.com).

For the sustainable environment, reduction of greenhouse gas, self-carbon offset becomes popular for consumers. The rapid growth in such supply of carbon neutrality organizations, they may restrict carbon trading in the aviation industry. The main purposes of the act are to achieve carbon neutrality and low carbon consumption and to promote responsibility for sustainable tourism (Sisman & Associates, 2007). Energy consumption and energy conservation have been widely discussed in the studies of environmental protection issues (e.g., Boyle, 2004). Implementing energy-conserving practices is reportedly essential for ensuring competitiveness in the hospitality industry. Chan (2005) investigated environmental actions in three hotels, including electricity conservation measures, gas and fuel oil conservation initiatives, and consumption assessment. The results of these studies indicate that energy conservation equipment can substantially reduce electricity and water usage in the restaurant industry. The same studies demonstrate that monitoring energy and using high-performance, low-wattage facilities are the most effective energy conservation measures in the restaurant industry.

Literacy implies not only the understanding of a particular, relevant body of knowledge and a set of relationships but also the ability and willingness to use that knowledge in a functional manner—to read and write. DeWaters, Powers, and Graham (2007) defined

energy literacy in terms of knowledge, attitudes, and behaviors. This definition creates important questions for discussion: How much and what kinds of knowledge are important for energy literacy? What types of behaviors and attitudes typify an energy literate individual? DeWaters, Powers, and Graham (2007) created an energy literacy scale that included three outcomes: cognitive, affective, and behavioral. Cognitive outcomes (knowledge) include topics that address the understanding of basic scientific concepts such as the laws of thermodynamics (conservation of energy; efficiency of energy conversion) and definitions and units of energy and power. Affective outcomes (attitude) include topics that are less specific and are intended to measure individuals' feelings about the urgency of the energy problem, their desire to learn and do more about energy conservation, and their belief in the relevance of their own decisions and actions to the overall global energy. Finally, behavioral outcomes include a handful of opportunities for demonstrating intentions and behaviors designed to gauge individuals' willingness to conserve energy with their everyday behaviors and their general capabilities for objective, critical evaluation of new ideas (e.g., Ramsey, 1993).

Hungerford and Tomera (1985) were the first to propose the environmental literacy model, which contains eight variables: ecology concept; locus of control; the problem of knowledge, beliefs, values, attitudes, and environmental sensitivity; and knowledge of environmental action strategies. Stables and Bishop (2001) and Pe'er, Goldman, and Yavetz (2007) pointed out the importance of environmental literacy, which is a personal issue for the environment with the knowledge and attitude to resolve the environmental problems of skills and motivation, as well as active involvement in maintaining the quality of life and the dynamic balance between environmental quality. Balgopal and Wallace (2009) created a cognitive-affective-behavior writing to learn model to enhance ecological literacy.

3. Research method and conceptual model

The researchers adopted a qualitative research method and conducted in-depth interviews with 16 F&B or engineering directors, educators (or researchers) of hotels and restaurants, and EPA employees. Through in-depth interviews, the researchers attempted to understand complex behavioral patterns without imposing any prior categorization that might limit the field of inquiry. Concepts were derived inductively from an initial set of qualitative descriptions, in this case the transcripts of interviews with F&B or engineering directors of hotels and restaurants and educators (or researchers) with regard to their ESCR practices. When these concepts were coded into rudimentary categories, they led to the collection of more descriptions. These initial descriptions were meaning units, which were extracted from the interview transcripts and could stand alone to convey ideas. To guarantee this project's credibility, participants were provided with documents, such as related ESCR action projects, official files, and photographs, thus enabling the researchers to conduct a triangulation analysis. Finally, to ensure the project's validity, the researchers used reflection notes to document their research methodology and the implications of their findings with regard to ESCR practices.

Data were collected during a two-month period, in which the researchers visited hotels, restaurants, hospitality schools, and EPA employees. All interviews followed a prescribed schedule to ensure that all the issues were discussed. Guaranteed confidentiality, 16 respondents were informed about the purpose of the project, and the interviews were

conducted using semi-structured, open-ended questions. This format allowed the researchers to ask more precise and tailored questions, and enabled individuals to be more expansive in providing illustrations, narratives, examples, and other relevant insights. The interviews were conducted individually and lasted about two hours each. Interviews were carried out at the respondents' convenience; most were held at the researchers' on-site location or in a quiet area of the subject's office. Each interview included questions on the following: subjects' individual backgrounds, corporate social responsibility, eco-friendly actions, ESCR practices used, and factors influencing the ESCR practices. The interviews were audio-recorded and fully transcribed. All respondents participated in the project voluntarily; the researchers had given them prior notice, and the respondents were later informed by the researchers' supervisors about the visit.

4. Results

According to the analytical results of the interview transcripts and upon modifying these with certain aspects of other literacy models (Hungerford & Tomera 1985), the researchers then structured an eight multi-dimension conceptual model of ESCR literacy: knowledge of issues; concept of industrial ecology; ESCR attitude; value; beliefs; locus of control; ESCR sensitivity; and ESCR action strategies (see Table 1 and Figure 1). The underlined statements below were direct quotes from the interview transcripts.

Dimension	Items
1.Knowledge of issues (7 items)	<ul style="list-style-type: none">• Knowledge of restaurant equipment energy usage• Related knowledge on the importance of sustainable foods• Related knowledge of greenhouse gas, such as carbon footprints• Related knowledge of ESCR architecture• Knowledge of energy saving and water usage• Knowledge of reducing restaurants' environmental pollution issues• Related knowledge of waste reduction and recycling of resources
2.Concept of industrial ecology (5 items)	<ul style="list-style-type: none">• Attentiveness to global warming and the role of the restaurant industry• Understanding the inter-dependent relationship between man and ecology• Respect for the effect of restaurants on the ecology of community environment• Understanding the possible environmental pollution problems caused by restaurants• Paying attention to the urgency of environmental issues
3.ESCR attitude (5 items)	<ul style="list-style-type: none">• Agree that technology cannot fully address the environmental problems caused by mankind• Provide consumers with comfortable service and enable them to adopt an active attitude toward environmental preservation• Willing to fulfill social obligation and strive toward the alleviation of global warming

Dimension	Items
4.Value (4 items)	<ul style="list-style-type: none">• Willing to support the various energy-saving and carbon reduction measures adopted by the restaurant• Strive for the high efficiency and low-cost usage of resources
	<ul style="list-style-type: none">• Adopting energy-saving and carbon reduction measures in the restaurant can contribute to the environment• Avoid using food ingredients with food mile to enhance the overall F&B quality• For the purpose of moral conscience, restaurants should avoid using environmentally unfriendly food ingredients and products such as high-pollutant lotions• Should conduct an environmental evaluation of the restaurant and then publicly announce the results
5.Belief (4 items)	<ul style="list-style-type: none">• Energy saving and carbon reduction rely on human effort; it all depends on whether we have the heart• Believe that the impact of the restaurant on the environment can be improved by integrating consumers' power• Believe the environment can be improved through a long-term evaluation of the results• Believe better results in energy saving and carbon reduction can be achieved through restaurant management
6.ESCR sensitivity (5 items)	<ul style="list-style-type: none">• Perceive that environment problems cannot be resolved by over-reliance on technology• Understand that Taiwan lacks resources and relies heavy on imports• Perceives that the environmental pollution problems of the restaurant industry can lead to serious consequences• Pay attention to the energy wastage situation of the restaurant• Pay attention to the environmental pollution problem caused in the service process
7.Locus of control (3 items)	<ul style="list-style-type: none">• Believe man has the ability to change the interactive relationship of this system• Believe the objective of energy saving and carbon reduction can be achieved through data analysis• Believe the emission of green-house gases can be reduced through efforts to clamp down on inappropriate behaviors
8. ESCR action strategies (10 items)	<ul style="list-style-type: none">• Willing to use ESCR equipment• Respect the sustainability of food and use local ingredients• Centralize handling of food semi-products to reduce resource waste• Examine service flow, such as providing the appropriate food portion, and reducing food packaging and cleaning frequency• Pay attention to the reduction of garbage and kitchen waste by reducing garbage, recycling resource, and pursuing a paperless

Dimension	Items
	system
	<ul style="list-style-type: none">• Use low-wattage culinary methods to reduce smoke, water pollutants, and chemical matters• Promote ESCR architecture, such as using local construction materials and low-pollutant decoration• Urge the government to implement restaurant environmental protection regulations• Urge the government to establish environmental protection incentive measures• Urge the government to promote ESCR restaurant certification and incentive measures• Willing to communicate energy-saving and carbon reduction concepts to colleagues and consumers

Table 1. Multi-dimensions of restaurant employees’ ESCR literacy

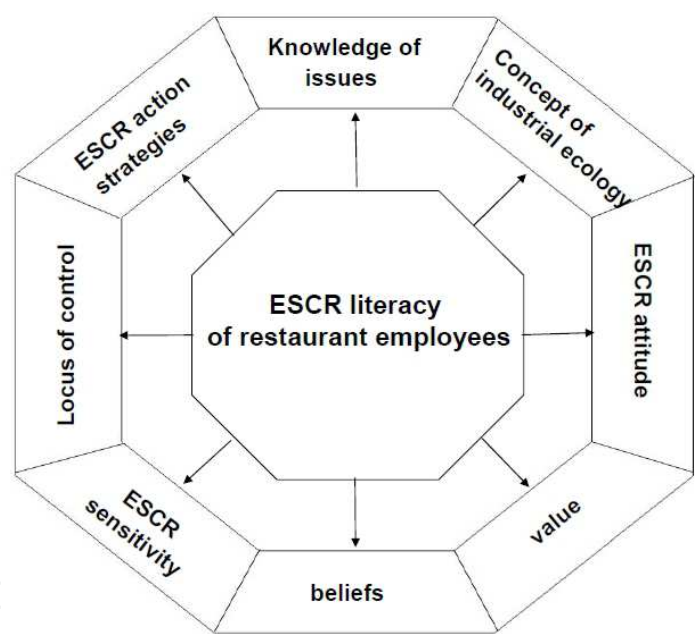


Fig. 1. ESCR literacy model of restaurant employees

4.1 Knowledge of issues

Experts of in-depth interviews agreed that the ESCR literacy of restaurant employees includes the knowledge of environment and ESCR issues, such as energy use, importance of sustainable food, waste reduction, and recycling, carbon disclosure and carbon footprint, ESCR construction and operating positions, and reduction of environmental pollution. Moreover, total environmental and ESCR knowledge includes the understanding of ecological principles and processes that are fundamental to comprehending the effects of humans on natural systems; the interrelationship between social systems and natural systems; the environmental issues arising from these complex interactions; and strategies of environmental action.

Hungerford and Tomera (1985) asserted that knowledge of issues may promote changes in human values and lead to overt action with respect to those issues. The results of their study describe ESCR knowledge of environmental issues as one's understanding of specific environmental issues that are important to ESCR literacy. These results also support other related studies, such as those by Ramsey (1993); Leeming, Dwyer, and Bracken (1995); Morrone, Mancl, and Carr, (2001); von Malmberg (2004); McMillan, Wright, and Beazley (2004); and Pe'er, Goldman, and Yavetz (2007).

"To reduce carbon, one should understand the power efficiency of machines when designing the kitchen... and the noise pollution of range hoods. Cooks should possess the knowledge of ESCR dishes, such as adopting local, in-season food ingredients or use simple culinary techniques to preserve the original flavor."

4.2 Concept of industrial ecology

Restaurant employees noted that industrial ecology concepts include the understanding of the environmental impact of food and the human environment, the role of global warming, environment and the relationship between dietary behavior, and noting the urgency of the issue. These results support other related studies of industrial ecology concepts, such as those by Ramsey (1993); Burstrom and Korhonen (2001); and McMillan, Wright, and Beazley (2004).

"Of the quantity of carbon that a cow produces, how much water and cereal products it consumes? Then, with such a consumption of cereal, how many of Africa's hunger population can we feed? Too much meat dietary is not suitable for our physical structure... also, the cost of a meat dietary is high and thus the social cost is high."

4.3 ESCR attitude

ESCR attitudes may reflect the initial enthusiasm characterizing a restaurant employee at the onset of a new ESCR direction. ESCR attitudes apply to general feelings toward ecology and the environment, feelings and concern for specific environmental issues, and feelings toward acting to remedy ESCR problems. Personal responsibility represents an individual's sense of obligation toward the environment, either in general or to a specific aspect (e.g., reducing air pollution or recycling).

The researchers extracted four ESCR attitudes from the analytical results: restaurant employees understand the relationship between technology and the environment; the F&B environment can adopt a positive and active attitude that incorporates consumers' comfort and environmental protection; fulfill social responsibility and willing to comply with the restaurant's energy-saving and carbon reduction measures; and support the restaurant's environmental regulations to improve environmental quality. From this result, the researchers concluded that through education, individuals can place more emphasis on the quality of the ecological environment, participate more in solving environmental problems, and gain more awareness of related environmental issues (Stapp, 1998). The above findings support other related ESCR attitude studies, such as those by Hines, Hungerford, and Tomera (1986/1987); Schindler (1999); and Cordano, Welcomer, and Scherer (2003).

"I personally believe that saving energy and reducing carbon depends on human effort. We have to dedicate toward it."

We should consider the attitudes in technology and the environment and the effect on Taiwan's restaurant environment issues."

4.4 Value

"Value," or "sense of value," is an abstract concept. The affective strand, concerned with the attitudes and values necessary to motivate the transformation of knowledge into responsible environment behavior, is also an important component for developing ESCR literacy. Environmental value can be classified into ecocentrism and anthropocentrism. These two types of value both respond positively to environmental preservation. What is different, however, is that ecocentrism indicates that human beings would protect the eco-system because they believe that it has an essential value; meanwhile, anthropocentrism concepts represent the belief that protecting the environment is important because nature provides human beings with rich resources (Dunlap & Van Liere, 1978). The researchers have extracted four values from the analytical results, such as "Avoid using food ingredients with food mile to enhance the overall F&B quality" (see Table 1). These values support the results of other related ESCR values studies, such as those by Hungerford and Tomera (1985), and Cameron, Brown, and Chapman (1998).

"Restaurant operators conduct energy diagnostics for the sake of saving energy... the underlying value is that their efforts can actually contribute to the environment.

F&B operators rarely use ESCR detergents because of their high price. Therefore, this involves a sense of value, namely business intuition."

4.5 Beliefs

A belief is not more than an idea that a person holds to be true, and a person's perspective about an issue depends heavily on his/her beliefs. If the belief is erroneous, the individual's values and attitudes can be biased in an ecologically faulty manner (Hungerford & Tomera, 1985). The researchers extracted four beliefs from the analytical results, such as "Believe that the impact of the restaurant on the environment can be improved by integrating consumers' power" and "Believe the environment can be improved through a long-term evaluation of the results." These belief results are related to the individual's value and attitude, which would then influence behavior. The results also support the findings of other related ESCR attitude studies, such as those by Hungerford and Tomera (1985), and Dunlap, Van Liere, Mertig, and Jones (2000).

"I believe our hotel and restaurant is able to do a good job in energy management because of human effort. We have to dedicate toward it."

4.6 Locus of control

Locus of control refers to the understanding that the ecological system is composed of humans, culture, living organizations, and physical environment, and that mankind has the ability to change the inter-relations of such a system. The empirical findings of the current study show that individuals with internal and external locus of control tend to take action on an issue because they feel their actions would help alleviate issues such as believing that they can improve restaurant service's impact on the environment by integrating consumers' power, and that they can achieve the objectives of energy saving and carbon reduction

through evaluating data and long-term results. These results are also factors associated with an individual's perception of whether a particular behavior will result in an anticipated reinforcement for acting. Other studies have argued that locus of control denotes an individual's perceptions of his/her ability to bring about environmental change through personal behavior. Someone who attributes change to external factors and not to personal behavior (external locus of control) is considered to be less inclined to influence a situation. Internal locus of control describes people who believe in their ability to bring about change through personal actions (Hungerford & Volk, 1990; Allen and Ferrand 1999). The results of locus of control include internal and external locus of control, and both are important dimensions of the ESCR literacy of restaurant employees.

"Do we have to control the direction of energy management? The simplest way would be to install water and electricity meters in every restaurant and then we can collect information afterwards.

As a citizen of Taiwan, I believe that I can integrate the powers of consumers and operators to improve the impact of restaurants on the environment."

4.7 ESCR sensitivity

ESCR sensitivity is an empathetic or understanding view of the environment. The interview results of the present study yielded the following four major ESCR sensitivity concepts: cannot rely on technology to address environmental pollution problems caused by restaurants; the major impact of the restaurant industry's smoke and wastewater emission on the environment; the carbon emission and energy exhaustion caused by restaurant locations; and the environmental risks caused by restaurant management. These results also support other related studies of sensitivity such as those by Chawla (1998) and Ramsey (1993), which defined environmental sensitivity as the predisposition of a person to empathize with the environment.

"We should let everyone know that Taiwan's energy sources are inadequate since some countries produce power through coal or nuclear power. For water emission, if we don't handle it properly then water pollution may result. This is also a form of environment sensitivity.

We should have the concept of geographical location. For example, what is the best location to establish a restaurant?"

4.8 ESCR action strategies

Restaurant employees showed an understanding of energy saving and carbon reduction strategies, including the knowledge of attitude change and initiating the efforts to propose actions and strategies related to environmental issues. The following ESCR action strategies were extracted from the interviews conducted by the researchers: willingness to use environmental protection/high performance/high efficiency equipment; changing the service flow to control serving portions; reducing food packaging and cleaning frequency; communicating and promoting knowledge about energy saving and carbon reduction to consumers; educating and transforming restaurant employees' concepts and developing their good habits; paying attention to waste reduction measures, such as implementing paperless systems, decreasing the number of one-time garbage disposals, recycling, and reducing range hood smoke, water pollutants, and chemical matters; using low-wattage

cooking methods and focusing on ESCR purchases; using a centralized kitchen to handle semi-finished products to reduce resource waste; respecting the sustainability of food and willingness to use local ingredients; creating energy-saving and carbon reduction plans; promoting ESCR education and using local construction materials; and urging the government to implement F&B environmental protection regulations. Stapp (1998) noted that when people confront environmental issues, they need to understand how to address these problems, fulfill their citizen obligation of supervising the government and providing solutions. These results support other related studies of ESCR action strategies, such as that by Kollmuss and Agyeman (2002).

“Use ingredients of the current season and simple culinary methods can preserve the original flavor of the dish. Also, the appropriate serving portion has to be considered.

In the restaurant industry that spans small eateries to large hotels, it is important to implement these energy-saving and carbon-reduction concepts (HC-083).

Adopt a centralized kitchen concept to handle ingredients! For example, the fish bones left over could be centralized and reused.

Restaurants adopt ESCR mark products and use local ingredients because the quality is good and cost is low.”

5. Discussion

Hospitality managers and educators are encouraged to incorporate environmental contents into the formal training and educational practices (e.g., Guane & Parsa, 2006). Prior studies emphasized and suggested that environmental education fosters awareness, understanding, and concern that motivate students to take action in their personal and organizational lives to facilitate environmentally sustainable behaviors (e.g., Rands, 2009). The results of the current study indicated that ESCR literacy contents include 43 items in eight categories: knowledge of issues; concept of industrial ecology; ESCR attitude; value; beliefs; locus of control; ESCR sensitivity; and ESCR action strategies. These results are congruent to other related studies, such as those by Goldman, Yavetz, and Pe’er (2006), and Wright (2008).

The eight-dimension ESCR literacy model of the present study is similar to other environment-related models such that the dimensions of knowledge, affective state, (attitude), and behavior are included (Balgopal & Wallace, 2009; Pe’er, Goldman, & Yavetz, 2007). Moreover, the ESCR literacy model is also congruent with the eight dimensions contained in Hungerford and Tomera’s (1985) model (ecology concept; locus of control; the problem of knowledge, beliefs, values, attitudes, environmental sensitivity; and knowledge of environmental action strategies). Many studies have argued that attitudes are typically considered to have knowledge, emotional (affective), and behavioral components (Hungerford & Tomera, 1985), citing the affective (attitude) portion of ESCR literacy as the most important because it includes three dimensions: ESCR attitude, locus of control, and ESCR sensitivity. The cognitive component of literacy includes two dimensions: knowledge of issues and concept of ecology; on the other hand, there is only one dimension in the behavior component of literacy: ESCR action strategies.

In conclusion, the current research presents a unique contribution to the existing body of ESCR literacy of restaurant employees. This study provides educators and the industry with a model of ESCR literacy content that highlights the essential components for the restaurant industry. Prior studies only discussed energy saving and the carbon reduction of food

related to footprint management (Gössling et al., in press), agriculture (Popp, Lotze-Campen, & Bodirsky, 2010), and metaphor. In addition, Oliver (1999) only explored food metaphors to discuss corporate strategy, including images of cooking involving mixing, using heat to transform things, and waiting for them to be finished. The results of the present study suggest that restaurant managers can improve the ESCR literacy of employees by training them in the components related to the cognitive, attitudinal, and behavioral dimensions. Doing so could foster an ESCR and ecologically sensitive working environment, activities, and behaviors for restaurant employees. Moreover, incorporating these ESCR literacy statements into training programs and the curriculum and/or reward eligibility criteria of the hospitality industry and environment education can improve the eco-friendly and ESCR practices of restaurant employees and enhance the food service industry's customer satisfaction and sustainability.

6. Vision for the industry

Although many hospitality studies demonstrate the need to address environment management and climate change, few studies attempt to identify the specific content of ESCR literacy of restaurant employees. The current study explored the important ESCR literacy contents to empower restaurant employees with a belief in their ability to contribute to environmental solutions through personal behavior. Related knowledge and skills are critical for the successful ESCR implementation of the hospitality industry.

7. Acknowledgements

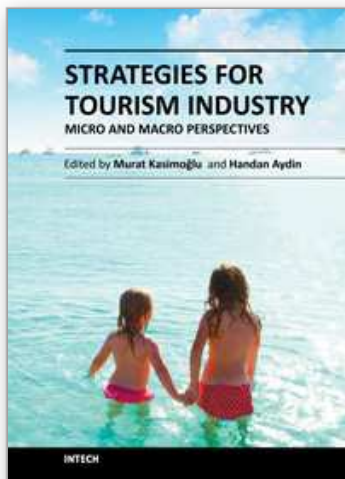
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8. References

- Allen, J. B., & Ferrand, J. L. 1999. Environmental locus of control, sympathy, and proenvironmental behavior. *Environment and Behavior*, 31: 338-354.
- American Dietetic Association, 2007. Position of the American Dietetic Association: Food and nutrition professionals can implement practices to conserve natural resources and support ecological sustainability. *Journal of the American Dietetic Association*, 107: 1033-1043.
- Balgopal, M., & Wallace, A. 2009. Decisions and dilemmas: Using writing to learn activities to increase ecological literacy. *Journal of Environmental Education*, 40(3): 13-26.
- Bansal, P., & Roth, K. 2000. Why companies go green: A model of ecological responsiveness. *Academy of Management Journal*, 43: 717-748.
- Benn, S., & Martin, A. 2010. Learning and change for sustainability reconsidered: A role for boundary objects. *Academy of Management Learning & Education*, 9: 397-412.
- Berry, A. B., & Rondinelli, A. D. 1998. Proactive corporate environment management: A new industrial revolution. *The Academy of Management Executive*, 12(2), 38-50.
- Blas, J. 2007. *Biofuel demand powering long-term food inflation*. Financial Times, July 5 2007.
- Boyle, G. 2004, *Renewable energy: Power for a sustainable future*, 2nd edn. Milton Keynes, UK: Oxford University Press.
- Burstrom, F., & Korhonen, J. 2001. Municipalities and industrial ecology: Reconsidering municipal environmental management. *Sustainable Development*, 9(1): 36-46.

- Chan, W. W. 2005, Partial analysis of the environmental costs generated by hotels in Hong Kong. *Hospitality Management*, 24, 517-531.
- Chawla, L. 1998. Significant life experiences revisited: A review of research on sources of environmental sensitivity. *The Journal of Environmental Education*, 29(3): 11-21.
- Chung, L. H., & Parker, L. D. 2010, Managing social and environmental action and accountability in the hospitality industry: A Singapore perspective. *Accounting Forum*, 34: 46-53.
- Cordano, M., Welcomer, S. A., & Scherer, R. F. 2003. An analysis of the predictive validity of the New Ecological Paradigm scale. *The Journal of Environmental Education*, 34(3): 22-28.
- Department for Environment, Food and Rural Affairs. 2007. *Food Service and Eating Out: An Economic Survey*. Surveys, Statistics and Food Economics Division, Department for Environment, Food and Rural Affairs (DEFRA).
- DeWaters, J.E., Powers, S. E., & Graham, M. 2007. Developing an Energy Literacy Scale, *Proceedings of ASEE Annual Conference and Exposition*, Honolulu, HI.
- Dubois, G., & Ceron, J. P. 2006, Tourism/leisure greenhouse gas emissions forecasts for 2050: Factors for change in France. *Journal of Sustainable Tourism*, 14(2): 172-191.
- Dunlap, R. E., & Van Liere, K. D. 1978. The new environmental paradigm: A proposed measuring instrument and preliminary results. *The Journal of Environmental Education*, 9(4): 10-19.
- Dunlap, R. E., Van Liere, K. D., Mertig, A. G., & Jones, R. E. 2000. Measuring endorsement of the New Ecological Paradigm: A revised NEP scale. *Journal of Social Issues*, 56: 425-442.
- García Rodríguez, F. J., & del Mar Armas Cruz, Y. 2007, Relation between social-environmental responsibility and performance in hotel firms. *International Journal of Hospitality Management*, 26: 824-839.
- Goldman, D., Yavetz, B., & Pe'er, S. 2006. Environmental literacy in teacher training in Israel: Environmental behavior of new students. *The Journal of Environmental Education*, 38(1): 3-22.
- Gössling, S., Garrod, B., Aall, C., Hille, J. and Peeters, P. 2011. Food management in tourism: Reducing tourism's carbon 'foodprint'. *Tourism Management* 32: 534-543.
- Goudie, C. 2008. Institutionalizing ecological literacy: A critical component of the New "Green" economy. *Business Perspectives*, 19(3): 16-21.
- Haugh, H. M., & Talwar, A. 2010. How do corporations embed sustainability across the organization? *Academy of Management Learning & Education*, 9, 384-396.
- Heaton, D. P. (2010). The story of stuff. *Academy of Management Learning & Education*, 9: 553-556.
- Hines, J. M., Hungerford, H. R., & Tomera, A. N. 1986/7. Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. *The Journal of Environmental Education*, 18(2): 1-8.
- Hjalanger, A. M., & Richards, G. 2002. *Tourism and gastronomy*. Abingdon: Routledge
- Hoekstra, A.Y., & Chapagain, A. K. 2007. Water footprints of nations: water use by people as a function of their consumption pattern, *Water Resources Management*, 21(1): 35-48.
- Hungerford, H. R., & Tomera, A. N. 1985. *Science teaching methods for the elementary school*. Champaign: Stipes Publishing Co., IL.
- Hungerford, H. R., & Volk, T. 1990. Changing learner behavior through environmental education. *The Journal of Environmental Education*, 21(3): 8-21.
- International Energy Agency. 2009. Key world energy statistics. From the World Wide Web: http://www.iea.org/textbase/nppdf/free/2009/Key_Stats_2009.pdf.
- Kollmuss, A., & Agyeman, J. 2002. Mind the gap: Why do people act environmentally and what are the barriers to proenvironmental behavior? *Environmental Education Research*, 8: 239-260.

- Laing, J, Frost, W. (2010). How green was my festival: Exploring challenges and opportunities associated with staging green events. *International Journal of Hospitality Management* 29, 261-267.
- Leeming, F. C., Dwyer, W. O., & Bracken, B. A. 1995, Children's environmental attitude and knowledge scale: Construction and validation. *The Journal of Environmental Education*, 26(3): 22-31.
- Leslie, D. 2007, The missing component in the 'greening' of tourism: the environmental performance of the self-catering accommodation sector. *International Journal of Hospitality Management*, 26: 310-322.
- Manaktola, K., & Jauhari, V. 2007, Exploring consumer attitude and behaviour towards green practices in the lodging industry in India. *International Journal of Contemporary Hospitality Management*, 19: 364-377.
- McMillan, E. E., Wright, T., & Beazley, K. 2004. Impact of university-level environmental studies class on students' values. *The Journal of Environmental Education*, 35(3): 19-28.
- Morrone, M., Mancl, K., & Carr, K. 2001. Development of a metric to test group differences in ecological knowledge as one component of environmental literacy. *The Journal of Environmental Education*, 32(4): 33-42.
- Oliver, R. W. 1999. Real time strategy: Strategy as sports! War! Food? *Journal of Business Strategy*, 20(5): 8-10.
- Pe'er, S., Goldman, D., & Yavetz, B., 2007. Environmental literacy in teacher training: Attitudes, knowledge, and environmental behavior of beginning students. *The Journal of Environmental Education*, 39(1): 45-59.
- Popp, A, Lotze-Campen, H., & Bodirsky, B. 2010. Food consumption, diet shifts and associated non-CO2 greenhouse gases from agricultural production. *Global Environmental Change*, 20: 451-462.
- Ramsey, J. M., 1993. The effects of issue investigation and action training on eighth-grade students' environmental behavior. *The Journal of Environmental Education*, 24(3): 31-36.
- Rands, G. P. 2009. A principle-attribute matrix for environmentally sustainable management education and its application: The case for change-oriented service-learning projects. *Journal of Management Education*, 33: 296-322.
- Scanlon, N. L. 2007, An analysis and assessment of environmental operating practices in hotel and resort properties. *International Journal of Hospitality Management*, 26: 711-723.
- Schindler, F. H. 1999, Development of the survey of environmental issue attitudes. *The Journal of Environmental Education*, 30(3): 12-16.
- Sisman, D. & Associates. 2007, Tourism estinations carbon footprints. Retrieved December 20, 2009, from: <http://www.thetravelfoundation.org.uk>.
- Stables, A., & Bishop, K. 2001, Weak and strong conceptions of environmental literacy: Implications for environmental education. *Environmental Education Research*, 7: 89-97
- Stapp, W. B., Bennett, D., Bryan Jr W., Fulton, J., MacGregor, J., Nowak, P., 1998. The concept of environmental education. In Hungerford, H. R., Bluhm, W. J., Volk T. L., & Ramsey, J. M., *Essential Readings in environmental education*.33-35: Stipes publishing L.L.C
- Tip, B. 2009, Sustainable tourism. *International Trade Forum*, 1: 21-23.
- von Malmberg, F. 2004, Networking for knowledge transfer: towards an understanding of local authority roles in regional industrial ecosystem management. *Business Strategy and the Environment*, 13: 334-346.
- Wright, J. 2008, Web-based versus in-class: An exploration of how instructional methods influence postsecondary students' environmental literacy. *The Journal of Environmental Education*, 39(2): 33-45.



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Today, it is considered good business practice for tourism industries to support their micro and macro environment by means of strategic perspectives. This is necessary because we cannot contemplate companies existing without their environment. If companies do not involve themselves in such undertakings, they are in danger of isolating themselves from the shareholder. That, in turn, creates a problem for mobilizing new ideas and receiving feedback from their environment. In this respect, the contributions of academics from international level together with the private sector and business managers are eagerly awaited on topics and sub-topics within Strategies for Tourism Industry - Micro and Macro Perspectives.

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