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Environmental literacy of business students

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ABSTRACT

This paper is based on a study performed in October 2008 among MBA and Masters Students within the Faculty of Business Administration at the University of Iceland. The aim was to see how the students rated their own knowledge of fifteen environmentally related concepts. The concepts used served as a proxy for the term ***environmental literacy.***

The following research question was used: How well do postgraduate students in business administration know concepts related to environmentally sound or sustainable corporate administrative practices? A voluntary questionnaire was prepared and an electronic version was sent by e-mail to students according to class post lists. It was submitted to a total of 217 MBA and Masters Students. The response rate was 117 answer, or 54%. The findings indicate that Masters students have not attended courses focusing on environmentally sound or sustainable business practices, and that their environmental literacy is very limited.

Before discussing the research results in this paper, the literature review covers the business environment and environmental challenges, as well as business education and environmental challenges.

1 INTRODUCTION

The Earth's biological and physical systems are under extraordinary strain at the beginning of the twenty-first century, making environmental issues one of the gravest challenges facing humanity. In January 2009, the world population was close to 6.8 billion, expected to reach 9.5 billion by 2050 (U.S. Census Bureau, n.d.a and b) leading to intensified strain on Earth's ecosystems and resources. Growing world population, increased life expectancy and increased consumption means that there is significant increase in demands for natural resources and "many resources are being extracted at levels that will inhibit future generations from satisfying their own needs" (Hoffman, 2000, p. 27). This level of resource extraction will adversely affect accessibility and pricing of resources, and therefore concerns almost every sector of the economy, including the business sector. This is however, a market shift that will impact some sectors more than others (Hoffman and Woody, 2008).

Many of the environmental issues facing humans are global by nature and do not respect man-made boundaries. In many cases global environmental issues are extremely complex and are in bad or worsening state, requiring urgent attention. Climate change, unsustainable management of water resources, scarce natural resources, health impact of pollution and hazardous chemicals and biodiversity loss are among those issues that need urgent attention. These problems cannot be solved without coherent government-wide policy action and co-operation with businesses and civil society, where the companies play a central role in driving eco-innovation (OECD, 2008:10). Businesses do not operate in a vacuum. They need input for their activities which they transform into products or services

through their processes. Since the 1960s, interdependence between businesses and environmental issues has unfolded leading to doubts about growth assumptions and the treatment of the environment as (1) an endless source of resources and (2) a limitless sink for waste (Hoffman, 2005). In addition to a process or service output there is also a generation of waste and emissions. This is the business environment facing business leaders today. One way to educate businesses about environmental and sustainability issues is through the business school curriculum.

1.1 BUSINESS ENVIRONMENT AND ENVIRONMENTAL CHALLENGES

According to OECD[1] natural resources and pollution have been underpriced, or even subsidized, and it is likely that market-based instruments, such as green taxes, emission standards and targets and trade permits will be employed to send price signals to businesses to make their operation more sustainable. However, there is still indecision about how to share the burden as costs and benefits of actions are unevenly distributed amongst countries and generations. One of the key barriers to decisive policy action is the concern of impact on industrial competitiveness. Nevertheless, trade and investment patterns are expected to change dramatically in the near future, and corporations are facing a new type of business pressure due to environmental issues. Foresighted private sector leaders are already making headway, encouraged by shareholders, customers and other stakeholders to utilize the first mover's advantages of eco-innovation in a market where the demand for environmental goods and

[1] Organisation for Economic Co-operation and Development

services is likely to increase extensively in the future. Short-sighted policies are insufficient when it comes to tackling long-term environmental challenges. If the business sector want to ensure long lasting success it is not enough to focus on the economic, non-economics has to be considered as well (OECD 2008).

Rachel Carson's book 'Silent Spring' set in motion a course of events leading to a ban on domestic production of DDT in the United States (Lear, 2002) and an onset of the environmental movement in many places around the world. Since then the scope and relevance of environmental issues have grown and are still expected to grow (Aydin and Morefield, 2008), among other things due to environmental disasters and scandals. Examples include the Love Canal disaster in the Unites States, where an industrial dumping site contaminated with toxic waste was used as a building site for private homes (1976), the leakage of toxic substances from the Union Carbide factory in Bhopal, India (1984) which killed more than three thousand people, and the Exxon Valdez oil spill in Alaska (1989), where thousands of birds and mammals were killed and the local fishing industry was damaged (Hoffman, 2005; Zechman, 2007), and they are just a few among many others. In the 1970s, enhanced scientific knowledge allowed people to study the environment in a more holistic manner. The book 'Limits to growth', published in 1972, was also being debated but served as food for thought. Technical evolution allowed for pictures being taken from space, showing the Earth as a "fragile sphere" (Soroos, 2005). In the 1960s, the environmental movement started to put pressure on the business sector. In the 1970s, corporations were tackling air, water and noise pollution, energy conservation and endangered species. In the 1980s, it was toxic and solid waste, acid rain, ozone depletion and environmental racism, and in the

1990s companies were concerned with global warming, recycling, pollution prevention, disclosure, biodiversity, sprawl and sustainable development (Whetten, Rands and Godfrey, 2006, pp 378).

According to Solomon, Bamossy and Askegaard (2002), concern for the environment or **environmentalism**, is no longer confined to recycling but applies to all aspects of the production and consumption processes and is affecting marketing strategies for products ranging from nappies to fast food. It is an organized movement of concerned citizens and government agencies to protect and improve people‘s living environment (Kotler, Armstrong, Wong and Saunders, 2008, p87). It has changed drastically since the 1960s. The first wave took place in the 1960s and 1970s. It was driven by environmental groups and concerned consumers. Governments were the prime impetus in the second wave, passing laws and regulations which hit some industries hard. Those waves have now synthesized into the third wave, more powerful than before. The result is that companies are now acknowledging their responsibilities for environmental impacts. “They are now shifting from protest to prevention and from regulation to responsibility.” (Solomon, Bamossy and Askegaard, 2002, p. 543). They have changed from being reactive to being proactive, seeking solutions to integrate environmental goals, developing organizational strategies and working out success indicators useful for executives and business owners (Hoffman, 2000).

A quarter of a century ago, business leaders were only concerned about clean air and water, safe food, and an intact ozone layer. At that point in time people didn't utilize the term "the environment" as their filter for scrutinizing everything from the food they consumed to the jobs they took (Lagace, 2002). Today, companies are searching for tools to integrate

environmental objectives into business strategy and metrics to translate progress into a language that shareholders and business managers appreciate (such as ROI and NPV) (Hoffman, 2000, preface xv). According to Porter and Reinhardt (2007) companies that persists in treating climate changes [and other environmental issues] solely as a corporate social responsibility issue, rather than a business problem, will risk the direst consequences. In a market transition due to environmental problems there will be winners and losers (Hoffman and Woody, 2008). There is increasing pressure that companies manifest social responsibility and deal with social and environmental issues. The pressure comes from various parties such as shareholders, legislative power, clients, suppliers, media, competitors, insurance companies, banks, NGOs and others (Hoffman, 2000). Under such circumstances one would assume that proactive companies that possess critical environmental knowledge would be better equipped to tackle new challenges than reactive ones. Ecological and economical affairs are now integrated with business affairs according to Hoffman and Woody (2008), and doing nothing means missing out on countless financial opportunities, while at the same time such companies are setting themselves up for long-term political, operational and financial challenges. Environmentally sound administrative practices can compound multiple benefits for companies, such as new marketing opportunities, decreased cost, increased efficiency, augmented customer and employee satisfaction and an improved image, just to name few (Hoffman, 2000). At the same time, companies reduce regulatory, legal, physical and reputational risk (Hoffman and Woody, 2008).

1.2 BUSINESS EDUCATION AND ENVIRONMENTAL CHALLENGES

It is assumed that academic institutions, especially business schools, have a key part to play in helping achieve more sustainable modes of economic activity (Coopey, 2003), but most business students are not trained to consider the environment as a key factor in business decision making (Hoffman, 2000), while paying attention to environmental issues has become an integral part of the way business practitioners do their job. [E]nvironmental issues are not perceived as a separate or disconnected area within the field of engineering, law, public policy, and public health (Hoffman, 2000, preface xvi), but they are tough sell in today's business schools and, unfortunately, the management profession remains the last among professional fields to acknowledge this fact (Hoffman, 2000). One major impediment to increasing student interest is the fact that environmental management is generally perceived as part of "socially responsible business". As such, it lies on the periphery of "real" business decision-making, and is thus outside the standard business curriculum (Hoffman, 1999, p. 4). According to Gardiner and Lacy (2005 pp. 175) there is a growing need for business educators to grab this issue by the horns. To date, with a few exceptions, business education at European and international levels has failed to answer this demand in a coherent way. This failure is due to a widespread lack of understanding of the debate and its strategic value within the core curricula of business schools, particularly in MBA courses. The influence of business schools on present and future business leaders do not pass on a strong, proven environmental mindset, according to studies, and "there are sharp attitudinal differences that separate students majoring in business or economics from other university

students" (Becker, 1997, pp 6). While companies can use environmental strategy for their advantages there is "unexercised potential of business to think and act" for the benefit of the environment which "may be attributed to management ignorance or indifference, perhaps much of the responsibility may be ascribed to an environmentally meager business school preparation" (Becker, 1997, pp 6). There is a reason to assume that the attitudes of tomorrow's businesswomen and men about good business behavior and good decision making for the success of their business and well-being of their local and global environment are, in fact, created to a remarkable extent during their years in business schools (Lämsä, Vehkaperä, Puttonen og Pesonen, 2008). Therefore, it is clear that business curriculum and knowledge communicated in business school can be critical in the fight against climate change consequences. Business education and research is by nature an academic field that deals with very practical situations, and must ultimately produce hands-on solutions, even in the form of theory. Thus, corporate sustainability thinking needs to be built into business education in a way that reflects the real issues that business people have to deal with, in everyday strategic decision-making, not just in times of crisis (Gardiner and Lacy, 2005 pp. 183).

There is a reason to be optimistic, as study of environmental management in colleges and universities appears to be on the upswing (Hoffman, 2000) and the schools are "beginning to embrace elements of environmental education with increasing numbers, emphasizing environmentalism as a core principle of their education" (Venkataraman, 2008 p. 8-9). To tackle environmental challenges executives have to be equipped with comprehension and knowledge about environmental issues, tools that can be used to deal with the problem. One way to identify how

well future leaders are prepared for the challenges ahead is to examine the business curricula and the environmental literacy of future business leaders in order to evaluate whether or not changes are needed.

Results from a survey published by the U.S. National Environmental Education Foundation in March 2009 show that environment and sustainability education within the business sector is a growing trend. A total of 1,354 respondents came from a mixture of mainstream, environmentally progressive large companies and small "green" companies, representing a broad range of industry sectors. Seventy-five percent of companies educate employees about environmental and sustainability goals, and nearly half of the companies not offering such programs are likely to educate their employees in this field within the next two years. The survey results reveal that there is growing need and interest for employee environmental and sustainability education and companies eager for tools helping them to implement such training programs successfully. According to survey respondents, the most important motivating factors for employees are concern for the environment and society, support or a mandate from the CEO, company reputation and job satisfaction. Despite the strong value placed on E&S [environment & sustainability], education companies indicated that they face several challenges when engaging employees, including lack of money, time, resources and executive support. (p. vii and viii). The terms most often used to describe environmental and sustainability activities of firms are 1) sustainability, 2) greening and 3) corporate social responsibility. A high percentage of respondents (78 percent) state that environmental and sustainability knowledge of job candidates will increase in importance as one of the company's hiring process within the next few years.

Between 1993 and 2005, the number of top companies in the developed countries producing sustainability reports has tripled. Environmental reporting has served as an icebreaker into much wider forms of corporate responsibility reporting (KPMG, 2005). The 2008 survey reveals that corporate responsibility reporting is now considered to be ‘mainstream’. In 2008, around 80 percent of the 250 largest companies worldwide issue such reports. The number went up from 50 percent in a 2005 survey. According to the result’s findings, these kinds of reports are now the normm and the motivation for reporting are now aspirational and innovative ones, instead of reactive and risk management factors. According to the KPMG (2005), the vast majority of the reports, mention supplier issues, due to the fact that companies are expected to extend their responsibility down the supply chain. It is expected that reports of this kind will become more common on national levels, as well as within small companies.

2 RESEARCH METHODS

Environmental issues are likely to have an effect on the business environment in the near future. As such, environmental issues will be among those challenges facing future business leaders. This research was conducted in order to examine the environmental literacy of MBA and Masters Students within the Faculty of Business Administration at the University of Iceland, as they are likely to assume business leadership in the near future.

A questionnaire was sent to students by electronic mail according to class post lists. In addition to the survey, a cursory examination was carried out in October 2008 on MBA and Masters Curriculums in business

administration, as they were displayed at the websites of the University of Iceland, University of Akureyri, Reykjavík University and Bifröst University. It revealed that there were no courses on environmentally sound business practices or sustainability, neither as core courses or elective courses.

2.1 PURPOSE OF THE RESEARCH

The purpose of this research is to examine the environmental knowledge of business students, as some of them might be forthcoming business leaders dealing with environmental issues. The University of Iceland, which is the largest university in Iceland, was chosen as a research scene. More specifically, graduate level business education within the faculty of business administration, was the chosen field. Graduate level students are expected to have more working experience than undergraduate students, and within this group lurk future business leaders. Until this research was executed, no research in this category has been carried out in Iceland, to the best of the researchers' knowledge. The research was designed to bring forth an understanding of the educational preparation of MS and Masters Students on how to enlace economical and ecological subjects and possibly to bring about a revision of business curriculums.

The goal of the research was to investigate environmental literacy of MBA and Masters Students registered in the programs of Human Resource Management, Marketing and international businesses, and Management and strategy within the Faculty of Business Administration at the University of Iceland. Several environmental and sustainability related concepts were used to evaluate the students' environmental literacy. The research question was: *How well do business students know concepts related to*

environmentally sound / sustainable business practices? Several sub-questions were used to bring forth further understanding of the students' environmental training and interest. In all cases, two questions were used to cover the same issues. One was formulated around environmentally sound business practices and the other one around sustainability practices. This was done in order to gain more holistic results if the respondents were not certain about the usage of terms.

- Have MBA and Masters Students been enrolled in seminars covering environmentally sound / sustainable business practices?
- Are MBA and Masters Students interested in participating in seminars covering environmentally sound / sustainable business practices?
- Do MBA and Masters Students reckon that environmentally sound / sustainable business practices can have positive impact on organizational operating results?
- Do MBA and Masters Students assume that environmentally sound / sustainable business practices will be among the challenges they will undertake in the near future?
- Is there a gender difference in the environmental literacy of business students?

2.2 SAMPLE

The survey sample consisted of 217 students pursuing their MBA or Master's degree in business at the University of Iceland, see table 1. In the MBA group there were 75 students and 142 in the group of Masters

Students studying the following educational subjects 1) Human resource management 2) Marketing and international trade and 3) Strategy and governance. Students were given the option to label themselves as 'Others' if they did not identify themselves with the specified course of the Master's programs. The response rate was 54%. The MBA response rate was 60% and 51% for the Masters students. In total, a 115 students ticked off their gender in the survey; thereof 40% male (46 individuals) and 60% female (69 individuals), which is similar to the gender ratio within the student body of the Faculty of Business Administration as a whole.

Age distribution is shown in table 1. All respondents gave an answer to the age category. Most were in the age bracket 36-40 years, or 20.5%. Next were those in the age bracket of 26-30 years, or 18.8%, then 31-35 years with 17.9% response rate and 41-45 years with 17.1% response rate. Less than 5 percent were in the age bracket of 21-25 years. The average age of MS students was within the age bracket of 31-35 year, while it was 36-40 years for the MBA students.

Table 1. Gender ratio, age and response rate.

	Frequency	**MBA students**	**MS students**	**Other faculties**	**Faculty not specified**
Number of participants	117	45	60	11	1
Gender					
Male	46	58%	23%	36%	100%
Female	69	38%	77%	55%	0%
Gender not specified	2	4%	0%	9%	0%
Age distribution					
21-25 years	5	0%	8%	0%	
26-30 years	22	4%	30%	18%	
31-35 years	21	18%	17%	27%	
36-40 years	24	27%	15%	27%	
41-45 years	20	22%	13%	18%	
46-50 years	16	20%	10%	0%	100%
51 years and older	9	9%	7%	9%	
Survey sample	217	75	142		
Respond ratio	54%	60%	51%		

2.3 QUESTIONNAIRE AND DATA GATHERING

The Environmental literacy of business students has been examined to some extent within academia. However, no questionnaires related to the subject came up in a ProQuest and ScienceDirect search. Therefore, a special questionnaire was developed by the researcher and published in Createsurvey.com. The questionnaire was build around the following themes: 1) Definition of terms; 2) Participation in seminars offering sustainable or environmental themes; 3) Knowledge of fifteen environmentally related terms; 4) Environmental or sustainability and operating results; 5) probability of undertaking tasks related to environmentally sound or sustainable business practices; 6) Demographics. Createsurvey.com, web-based survey software, was used for programming the survey and for data gathering. Likert-scale where 1 indicates 'very little' and 5 indicates 'very good' knowledge of the terms was used for the environmental terms questions, but for other questions a seven-point Likert-scale was used, except for the demographic questions.

The respondents filled out the questionnaire at their own convenience on a voluntary and anonymous basis during the period between October 24 – 30, 2008. The data was transferred into Excel and Minitab for descriptive and inferential analysis. Once during the period, a reminder was e-mailed. However, the majority of the questionnaires came during the first four days, or 96%, thereof 55% the first day. It can therefore be assumed that those who do intend to respond will do so quickly. Mood Median and Chi-square tests were used for statistical analysis, with the statistical significant level at 5%.

2.4 CONCEPTS

In the research plan ***Environmental literacy*** was defined as "a basic understanding of the concepts and knowledge of the issues and information relevant to the health and sustainability of the environment" (Wolfe, 2001 pp. 302). Two concepts were defined in the first section of the questionnaire:

Environmentally sound practice is a business operation where products or services are not harmful to the environment.

Sustainable business is a business obtaining equilibrium between economic, social and environmental elements of the business.

Other concepts were simply listed in the questionnaire, without being defined for the students. Students were asked to what extent they rate their knowledge of the following concepts on a five-point Likert-scale, where 1 indicates 'very little' and 5 indicates 'very good' knowledge of the terms.

1. Eco-Management and Audit Scheme (EMAS)
2. Corporate Social Responsibility (CSR)
3. Carbon Offset / Carbon Neutrality
4. Carbon footprint
5. Life Cycle Assessment
6. Climate Change
7. Greenhouse Gas Emission
8. Sustainable Business
9. Environmental accounting
10. Environmental audit
11. Eco-label
12. Environmental management system (EMS)
13. Emission trading
14. Eco-friendly
15. Triple bottom line - TBL

2.5 RELIABILITY AND VALIDITY

The questionnaire was pretested by a group of people with MBA or Masters degrees in business administration, or people pursuing such degrees, but not used as a part of the sample. They were asked to review the questionnaire, both its function and its contents. In addition, the questionnaire was reviewed by instructors in the Elements of methodology class. Environmental terms used in the survey were reviewed by the Director of the Environment and Resources graduate level program at the University of Iceland. In total 117 surveys were completed, and for individual questions generally 115-117 answers were filled in, meaning that it was relatively easy to complete the survey. The intervals were chosen diligently and the same intervals used for the same type of questions. The questionnaire and supporting documents, description of execution etc. facilitates a straightforward duplication of the survey. Respondents were selected by consideration that they would reflect upon future business leaders expected to be facing environmental issues in their future occupations.

2.6 LIMITATIONS IN THE PREPARATION PHASE

Createsurvey.com was used for designing the layout of the questionnaire. Minor problems occurred during the setup phase of the questionnaire, due to a lack of experience of using the software tool. It took some time to work out how to define different setups for different types of questions, e.g. landscape versus portrait setups. When the data was transferred from Createsurvey.com to Minitab, it was transferred as text instead of numbers, and each column had to be manually changed before the analysis could take place. When a questionnaire is designed in Createsurvey.com, it is possible

to preview it as often as needed to ensure the setup is acceptable and that all options are in place. When previewing the questionnaire, Icelandic letters were displayed as symbols instead of letters. After experimenting with the software, it became clear that this was only matter of patience, as it took the software some time to access and display Icelandic letters. When participants have started to enter answers into the database this review option is no longer available, and if the questionnaire is previewed the software creates a new questionnaire with a new survey ID. However, this does not create a problem as responses are steered automatically into the original questionnaire database. Other problems did not occur. The majority of the questionnaires were completely filled out by the participants.

3 Results

The opening questions of the research provided very conclusive results. Students were asked whether or not they had been enrolled in seminars covering environmentally sound or sustainable business practices offered by the University of Iceland, see figure 1. More than 90% of the students (105 individuals) had not been in seminars covering environmentally sound business practices and 84.6% (99 individuals) of the students had not been enrolled in seminars covering sustainable business practices. What is of interest is that 6% of the students (7 individuals) were not sure if they had been enrolled in seminars covering environmentally sound business practices, while 2,6% (3 individuals) were not sure about enrollment in seminars covering sustainable business practices.

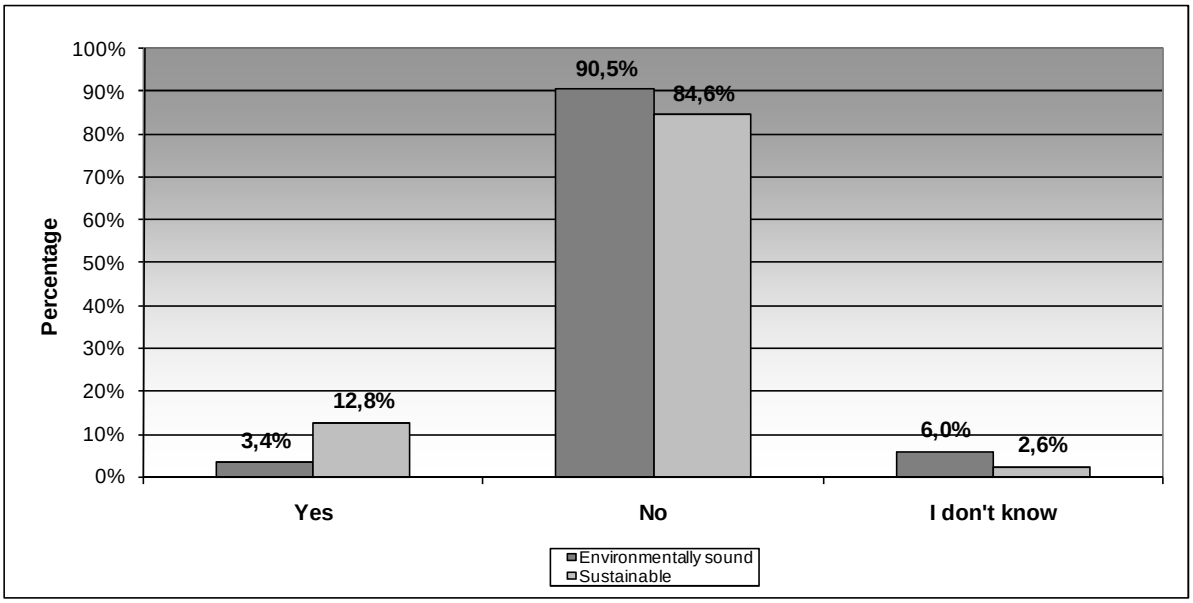

Figure 1. Enrollment in seminars covering environmentally sound or sustainable business practices.

When students were asked to what extent they were interested in participating in seminars covering environmentally sound or sustainable business practices, a quarter of the students gave a neutral response, see figure 2, which means that they were neither interested nor uninterested. In total 39.7% of the students (46 individuals) have very little or rather little interest in attending seminars covering environmentally sound business practices. The ratio of students ticking the same response options on sustainable business practice seminars was somewhat lower, or 28.2% (33 individuals). Students very much interested, much interested and somewhat interested in attending seminars on environmentally sound business practices were 35.3% (41 individuals), compared to 47% that showed very much interest, much interest and some interest in attending seminars covering sustainable business practices. This is sizable interest, but one has to keep in mind that the majority of respondents are only somewhat interested, or 31.6% (37 individuals).

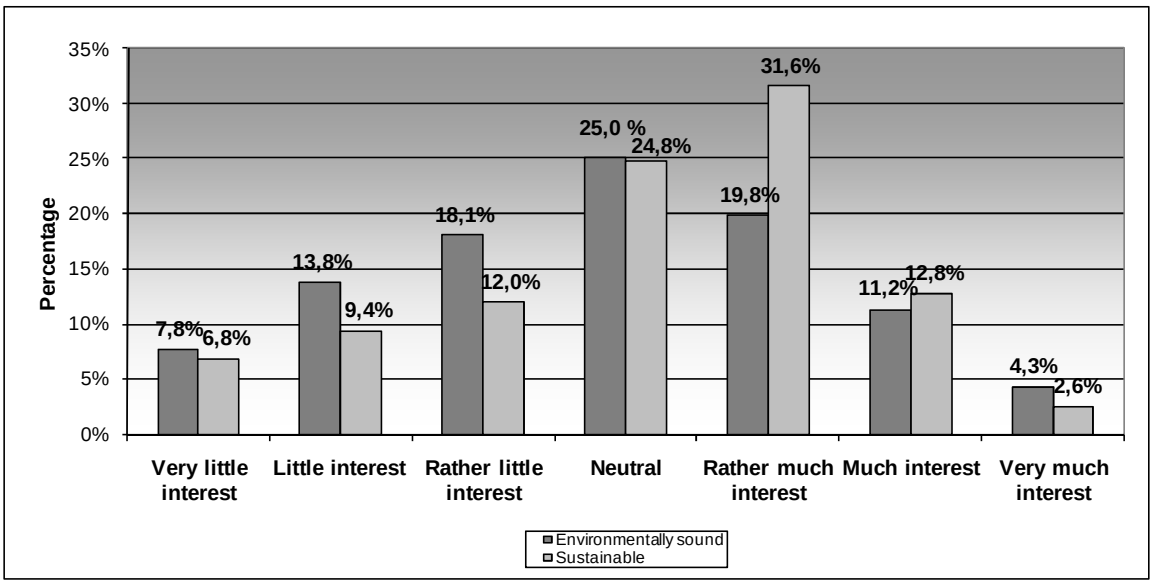

Figure 2. Interest in seminars covering environmentally sound or sustainable business practices.

A Chi-Square test was performed to examine if there was a statistical difference between interests in environmentally and sustainable business practice seminars. According to the test results (p-value 0.489) there was no difference in interest by seminar types. In addition, a Mood Median test was performed to examine if there was any statistical difference by educational subjects (p-value 4.444), between MBA and MS students (p-value 0.069) and age of participants (p-value 0.277). In neither case was there a statistical difference between the groups. However, the Mood Median test results showed statistical difference between genders, where the p-values were 0.004 and 0012. Women showed more interest in environmentally sound and sustainable business practices than men. The median for men was 4.0 on a seven-point Likert-scale while it was 5.0 for women.

When analyzing respondent's attitudes towards positive impacts on organizational operating results, it comes into view that only a minority of students believe the impact to have very negative, negative or rather negative impact on organizational operating results, see figure 3. The

response rate for those three options was 9.6% (11 individuals) regarding environmentally sound business practices and only 5.2% for the sustainable business practices (6 individuals). It should be highlighted that of those 17 individuals on the negative side of the scale, none is very negative, only one is negative and the rest is somewhat negative. For both of those questions, those responding as neutral are one third of respondents. A very high percentage of respondents believes that environmentally sound and sustainable business practices have somewhat positive, positive or very positive impact on organizational operating results, in total 57.4% (66 individuals) and 59.5% (69 individuals). Thereof, most respondents believed the impact to be rather positive, or 35.7% (41 individuals) and 38.8% (45 individuals).

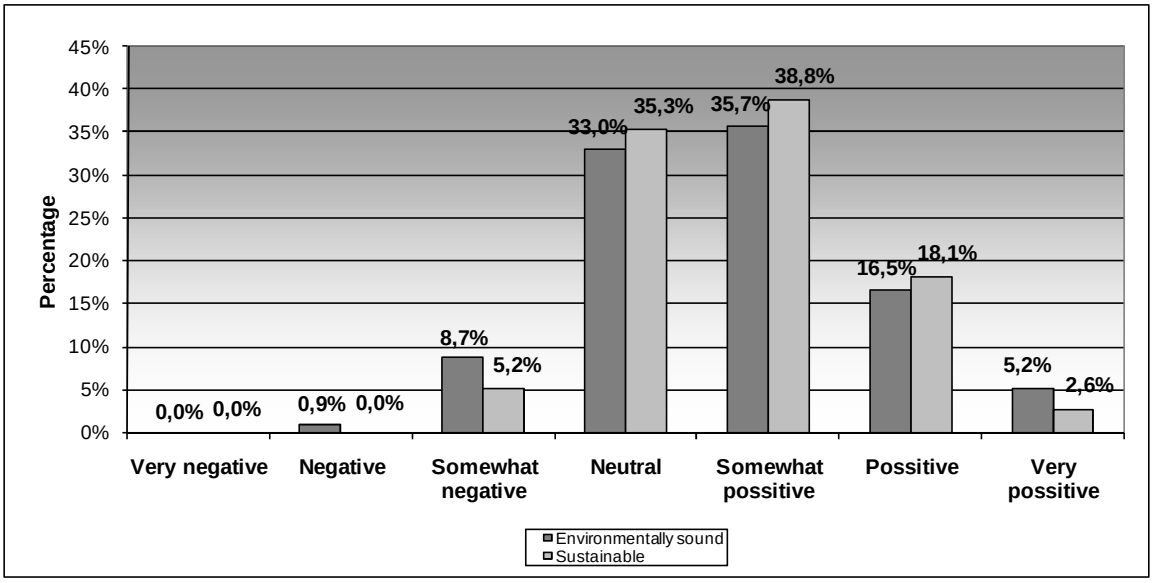

Figure 3. Impact of environmentally sound or sustainable business practice on organizational operating results.

As none of the respondents marked the option ‘very negative’ and only one ticked the option ‘negative’, it was not possible to perform a Chi-Square

test to assess statistical differences between groups. By removing these two options it was possible to perform the test on the remaining options. According to the test results, there was no difference between those judging environmentally sound or sustainable business practices having positive impact on organizational operating results (p-value 0.661). Chi-Square was also used to assess if there was a difference between genders for those questions. There was no statistical difference between gender (p-value 0.095 and 0.472), age (p-value 0.313 and 0.848) or educational subjects (p-value 0.688 and 0.927).

Those assuming that there is little, somewhat little or very little probability that environmentally sound business practices will be among the challenges they will undertake in the near future are 27.6% (32 individuals) while those believing it to be somewhat likely, likely or very likely are 37.9% (44 individuals), see figure 4. Same percentage, or 27.6% (32 individuals) believe that there are very little, little or somewhat little probabilities that sustainable business practices will be among the challenges they will undertake in the near future. This is more than a quarter of the respondents. There is a slight decrease in the percentage of those assuming somewhat likely, likely or very likely that those will be the challenges facing them in the near future, or 32.8% (38 individuals). There is some increase in those who are neutral, or 5.2% (6 individuals).

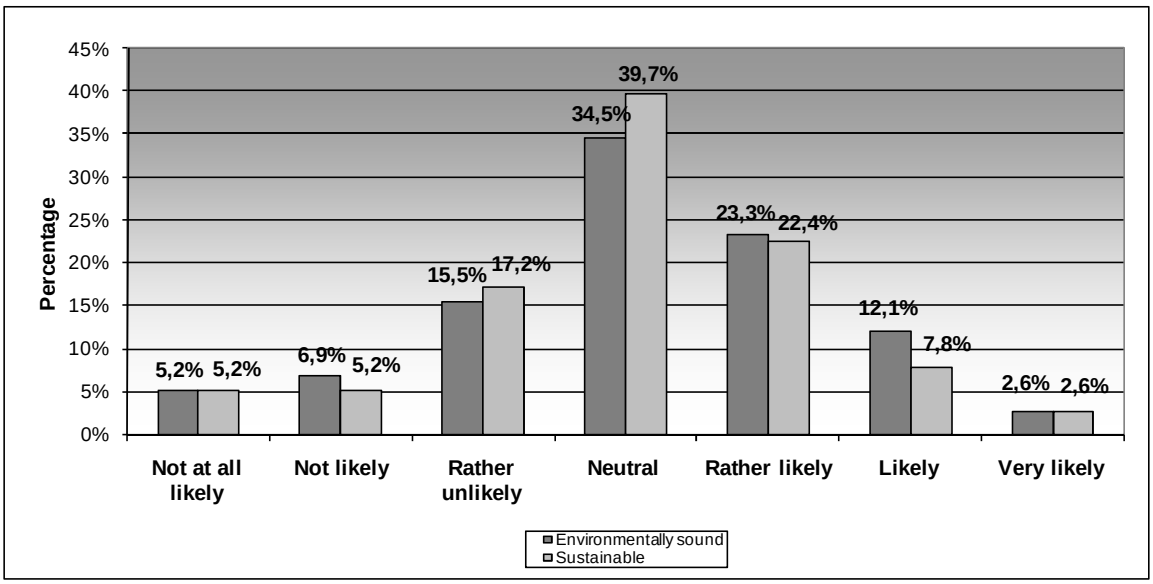

Figure 4. Challenges related to environmentally sound or sustainable business practices in the near future.

A Chi-Square test was performed to assess if there was a difference between those believing that environmentally sound or sustainable business practices will be among the challenges they will undertake in the near future. There was no statistical difference between the groups (p-value 0.927). According to the Mood Median test, there was no statistical difference between gender (p-value 0.867 and 0.705), age (p-value 0.267 and 0.276) or education (p-value 0.835 and 0.956).

A radar chart was used to plot the mean number of each environmental term used in the questionnaire. The results are shown in figure 5.

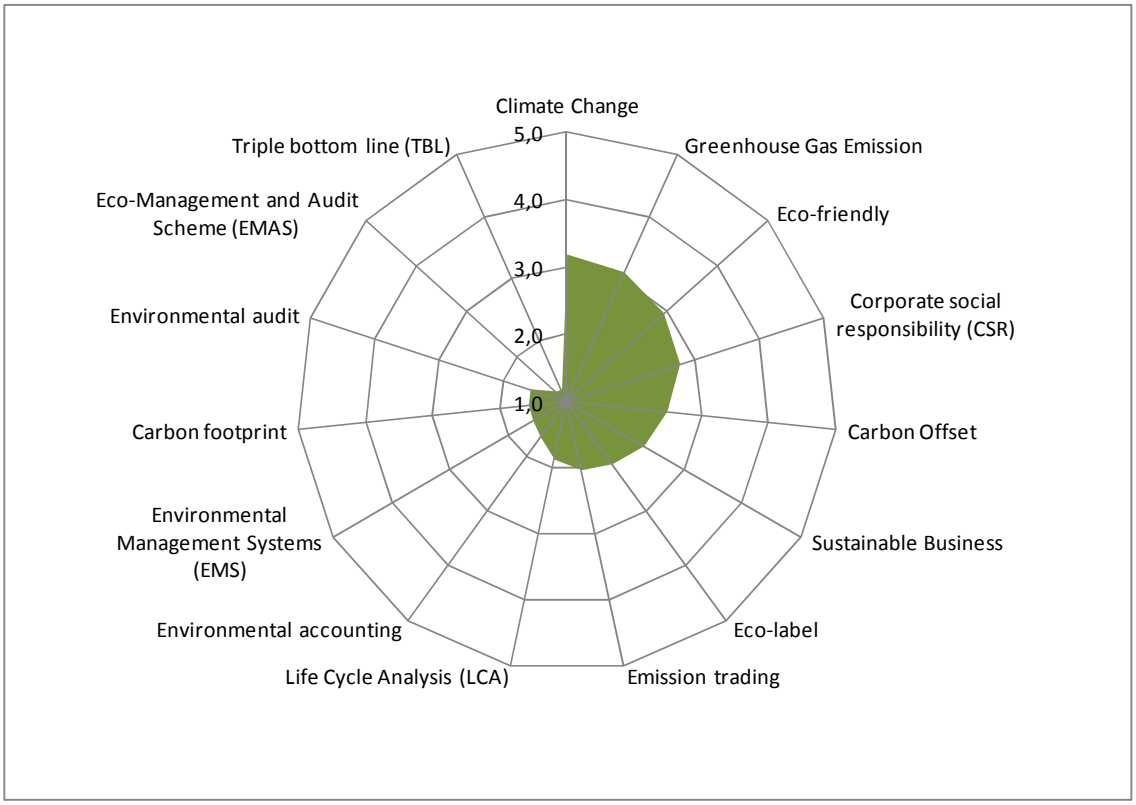

Figure 5. Radar chart of the mean for the environmental terms.

According to the radar chart, there is very limited knowledge (1.2) about *EMAS*, the *Eco-Management and Audit Scheme* which is a "management tool for companies and other organizations to evaluate, report and improve their environmental performance" (EMAS, 2009) or *Triple bottom line* (TBL) which is a business principle of environmental, social and economic aspects, as opposed to a single bottom line in monetary terms (Söderbaum, 2008). The knowledge of several terms was less than limited (1.6 - 1.9). This includes the terms *environmental auditing* (1.6) which is an assessment by an independent third party of an organization's compliance with local laws and regulations (BusinessDictonary.com, n.d.), *carbon*

footprint (1.6) which is the overall amount of CO_2 emissions associated with a product (European Commission, 2007), *EMS environmental management systems* (1.6) which is a set of processes and practices that enable an organization to reduce its environmental impact and increase its operating efficiency (EPA, n.d.a), *environmental accounting* (1.7) when the costing of environmental impacts caused by the corporation are included in the corporate accounting (OECD, 2001 a) and *Life Cycle Assessment* (1.9) which provides the basis for calculating carbon footprints of goods and services in a robust way (European Commission, n.d.). The students had a limited knowledge of *emission trading* (2.0), which allows countries [or companies] that have emission units to spare from the Kyoto protocol targets to sell the excess capacity to countries [or companies] that are over their emission target limits (UNFCCC, n.d.).

Five terms had a mean between 2.2 and 2.9, signifying that the knowledge was somewhere between limited and neutral, which means neither limited nor good. Those were the terms *eco-labels* (2.2) that usually covers a wide range of environmental impacts across the lifetime of a product, from production and use through to disposal (Directgov, n.d), *sustainable businesses* (2.3) which are for example businesses that have shifted their focus from compliance of environmental laws and regulations to resource efficiency and best practice of continuous improvement (EPA Victoria, 2009) and *carbon offsets* (2.5) defined as a monetary investment in a project or activity elsewhere that abates greenhouse gas (GHG) emissions or sequesters carbon from the atmosphere that is used to compensate for GHG emissions (EPA Victoria, 2008). Other terms ranked from being limited to neutral were *corporate social responsibility or CSR* (2.8), where corporations are expected to assume responsibility within the

societies where they operate, are socially responsible and demonstrate good citizenship (Garsten and Jacobson, 2007) and *eco-friendly* (2.9) referring to goods and services which are considered to inflict minimal harm on the environment (Tjell, 2009).

Knowledge of two terms was rated between neutral and good, albeit much closer to neutral than good. Those were the term *greenhouse gas emission* (3.1) where gases that trap heat in the atmosphere are emitted through natural processes or human activities (EPA, n.d.b) into the atmosphere, for example the burning of fossil fuels and *climate change* (3.2) where the build-up of greenhouse gases (GHGs) threatens to set the Earth inexorably on the path towards an unpredictably different climate (UNEP, n.d.). The reason why those terms get the highest score is not known, but it might be because those terms are regularly covered by the media. Still, the knowledge is nowhere near to being good.

Box plot, see figure 6, was used to analyze outliers in the sample. In some cases, the mean is a little bit higher than the median. In such cases, some respondents gave higher marks than the majority of the respondents. In the box plot the blue dots symbolize the mean but the red dots the median.

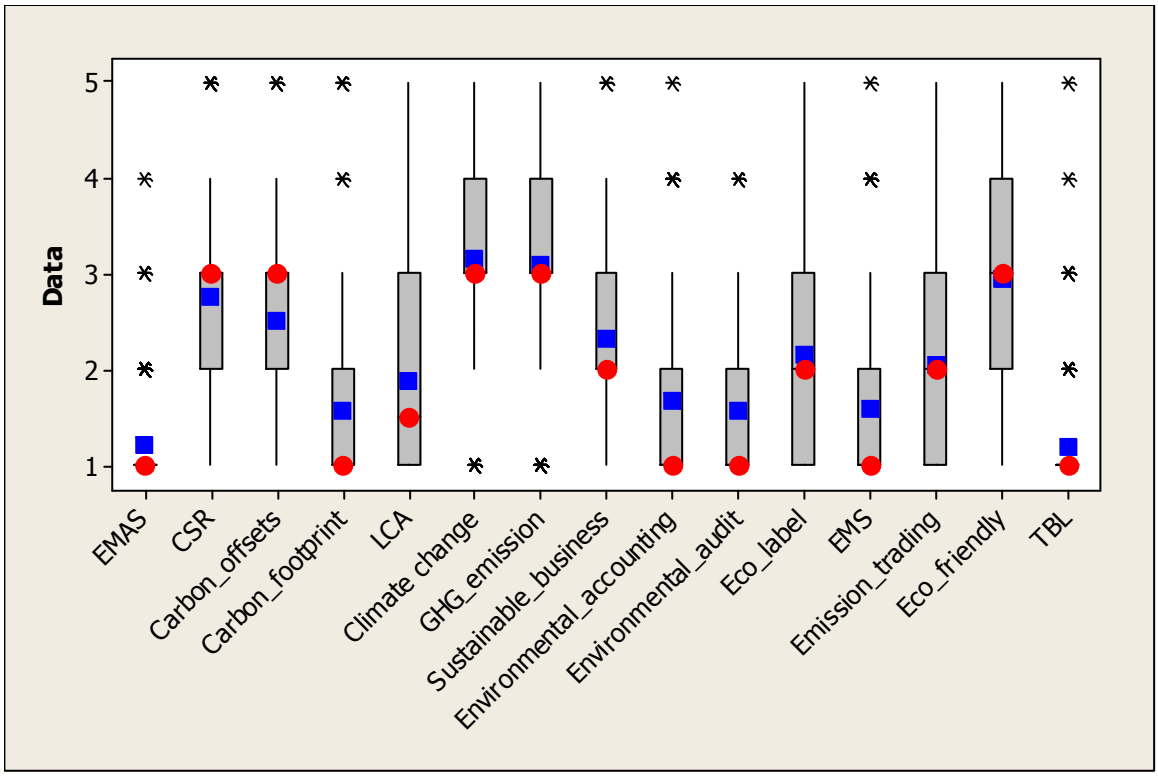

Figure 6. Box plot of environmental terms, mean and median.

The box plot is used to assess and compare sample distributions. Each box is divided into quartiles. Outliers are an unusually large or small observation, values which are beyond the whiskers characterized with stars. The bottom line of the box is the first quartile (Q1), which means that 25% of the data values are less than or equal to this value. The top line of the box is the third quartile (Q3), that is to say that 75% of the data values are less than or equal to this value. Median (red dot) represents the middle of the data. Half of the observations are less than or equal to it. By default, the upper whisker extends to this adjacent value, which is the highest data value within the upper limit. Upper limits are Q3 + 1.5 (Q3 – Q1). By default, the lower whisker extends to this adjacent value that is the lowest value within the lower limit. The lower limit = Q1– 1.5 (Q3 – Q1) (Minitab, n.d.).

A Chi-Square test was used to assess if there was a statistical difference between the knowledge about environmental terms. The results are listed in table 2. According to the test results, there was no statistical difference in knowledge about climate change and greenhouse gas emission, eco-friendly and CSR, but the students' knowledge was neither limited nor good. However, there was statistical difference between climate change and other terms in the survey where the students had either limited or very limited knowledge about the environmental terms. In none of the cases did the students have good or very good knowledge of the environmental terms. In table 2, all the concepts with p-value of 0.000 are listed in the same square, while other terms are listed separately. Mean values of the terms are also listed in the table.

Table 2. Statistical analysis of knowledge of environmental concepts.

Environmental concepts	Mean	Comparison concept	Mean	[1]P-value
EMAS, TBL, carbon footprint, environmental audit, EMS, environmental accounting, LCA, emission trading, eco-label, sustainable business and carbon offest	< = 2,5	Climate change	3,2	0,000
Corporate Social Responsibility - CSR	2,8	Climate change	3,2	0,059
Eco-friendly	2,9	Climate change	3,2	0,208
Greenhouse Gas Emission	3,1	Climate change	3,2	0,941

[1]Pearson Chi-Square statistical test

A Mood Median test was performed to see if there was a statistical difference of knowledge of men and women. There was only a statistical difference to be found in five of the terms. Those were *carbon footprint* (0.003), *Life cycle assessment - LCA* (0.007), *environmental accounting* (0.047), *environmental audit* (0.012) and *eco-friendly* (0.001). In all of these cases did the men rank their knowledge higher than women, except for the term eco-friendly, where the women ranked their knowledge higher than men. In terms of educational subjects, there was a statistical difference

in five terms, which are *carbon footprint* (0.040), *environmental audit* (0.022), *eco-label* (0.035), *emission trading* (0.012) and *eco-friendly* (0.025). MS students in Marketing and international business ranked their knowledge highest on the following terms; environmental accounting, eco-label and eco-friendly. Students in the group called *others* ranked their knowledge highest on carbon footprint and MS students specializing in human resource management ranked their knowledge highest on emission trading.

4 Discussion and conclusion

The main result of the research, which is the limited environmental literacy of MBA and Masters Students, does not come as a surprise. To some degree, this can be attributed to a lack of environmental education. The majority of the students (85-90%) claim that they have not acquired such training. What came as a surprise was that 2.6-6% of the students did not know whether or not they had received environmental or sustainability education.

The findings of the research support the theory, discussed at the beginning of this paper that people with education from the faculty of business administration are lagging behind other students from other faculties in adopting environmental training (Hoffman, 2000). However, this cannot be argued with certainty, except by replicating the research with comparison groups from other faculties offering environmental training, such as environmental engineering, environmental law, environmental economics, environmental ethics, health science, political science and others. Limited environmental knowledge of business administrators is

believed to result from the fact that within the faculty of business administration protection of the environment is not regarded as a core aspect of business decisions; rather it is considered to be a part of borderline decisions (Hoffman, 1999). A cursory observation of the business curricula offered by Icelandic universities in October 2008 also supports those theories, as no environmental or sustainability seminars were offered to business students, while they are offered by many other faculties.

The results of this research show that students are more interested in seminars on sustainable business practices than environmentally sound business practices, which is, however, a part of the sustainable business practice. There is a substantial number of students (47%) showing rather much, much or very much interest in attending such seminars. However, one has to keep in mind that the majority, or 31.6%, are rather interested. Female students are more interested in attending such seminars than male students. To meet the needs of students showing interest in the subject, it could easily be integrated into other seminars. If the University of Iceland would like to become a leader in the field of sustainable business practices, such seminars should be on the curricula as mandatory seminars.

What is also of interest is the list of environmental terms which students claim to know best, which includes climate change and greenhouse gas emissions. The explanation might be that those terms are frequently employed by the media. Still, the knowledge is neither good nor limited. It is also of interest that there is a passable knowledge about corporate social responsibility or social responsibility, but the students do not seem to relate the term to triple bottom line (TBL) which ranks very low in the research (1.2) despite the fact that the term includes economical, environmental and

sociological elements, i.e. CSR can be regarded as one dimension of the TBL concept.

A large percentage of students, or 32.8% and 37.9% of the students believes that the likelihood of them tackling environmental or sustainability issues in the near future are rated high, high or very high. Still, they do not receive training on how to solve such problems, e.g. by learning about environmental management systems, environmental accounting, environmental auditing, eco-labeling etc. The most preferable way, however, would be proactive actions of executives exploiting environmental affairs to build competitive advantages for their business, instead of regarding it as a nuisance and obstructive legal obligations to fulfill.

It would have been informative to offer options for detailed answers to some of the questions, such as why or why not participants believe that environmental issues will be among challenges they will undertake in the near future. In this context, it should be mentioned that a very high percentage of respondents believe that environmentally sound and sustainable business practices have a somewhat positive, positive or very positive impact on organizational operating results, in total 57.4% (66 individuals) and 59.5% (69 individuals). However, most respondents believed the impact to be rather positive, or 35.7% (41 individuals) and 38.8% (45 individuals). This result contradicts results from Eggertsson's (2003) Masters thesis, where executives claimed that cost is the main hindrance in implementing environmental management. It would have been of value to investigate further with an open question the reason behind the students' stance on this topic.

4.1 LIMITATION AND FURTHER RESEARCH

Overall, the planning and execution of the research went smoothly. The response rate was 54%. It might have been improved by sending a reminder once more. It is considered necessary to have a direct access to the participant mailing list, because in that way the researcher can fully control the follow up of reminders, and can analyze the sample as needed, e.g. the gender ratio of the sample.

This survey provides a foundation for new research topics, such as performing a new survey on environmental literacy among business students from all the Universities in Iceland offering MBA or Masters Programs of business administration. Parallel benchmarks between business curriculum of Icelandic universities and leading business schools in terms of environmental or sustainability emphasis could also be made. Findings could help Icelandic universities revise their business curriculums.

A comparison of environmental literacy by faculties, such as business administration, engineering, law, economics, public administration and health science could be an interesting research topic. The aim of such studies would to learn whether or not the environmental literacy of business students is inferior to the environmental literacy of students from other faculties.

The list of concepts could be developed further in order to examine in more detail the environmental literacy of students. A focus group could be used to review the list before the questionnaire would be submitted again. Terms such as *renewable natural resources,* which are natural resources that, after exploitation, can return to their previous stock levels by natural processes of growth or replenishment (OECD, 2001 b) and *non-renewable*

natural resources that are exhaustible natural resources, such as mineral resources that cannot be regenerated after exploitation (OECD, 2001 c). Questions regarding environmental laws, regulations and international conventions that corporations need to operate by, either in domestic or global competitive environments, could also be added.

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