Information Literacy and Environmental Sustainability Correlation in Using and Communicating Information

Angela Repanovici[1], and Ane Landoy[2]

[1]Transilvania University of Braşov, Romania
arepanovici@unitbv.ro
[2]University of Bergen Library, Norway,
Ane.Landoy@uib.no

Abstract. Information literacy is the discipline that shapes the informational behavior of young students, Master and PhD students. The skills acquired by attending this course can decisively influence thinking and may generate critical thinking for analyzing information. Extending the module designed for achieving Information Literacy standards, we present a module on green practices, green libraries and the implications of using electronic resources on carbon emissions and consumption of electricity. Our premise was that these concepts may help develop sustainable thinking, in addition to critical thinking. In this paper we will focus mainly on the green information literacy aspect, through a study from Transilvania University of Brasov.

Keywords: Information literacy, environment, sustainability, green movement, search strategies.

1   Introduction

Along with the growing concerns for climate changes and global warming among the general public there comes an awareness of many actions that we used to think of as environmentally neutral but are in fact damaging the environment. Libraries, who used to be custodians of informational sources in the time of printed books and journals, became pilots and information brokers when the digital age arrived and information sources were suddenly readily available. The fifth law of the long standing laws of Librarianship by Dr Rangnathan states that a 'Library is a growing organism' [1]. Hence, the imperatives of the new information environment required that the competencies of knowledge organization were developed and implemented with creativity or innovation and a sense of entrepreneurship. Academic libraries developed Information Literacy programs for their patrons, enabling them to find and use the information they needed in an ethical way. But they did not think about sustainability.

2   Green Libraries, Green Practices

A lot of the work going on in a library can be considered as logistics. As well as the actual movement of printed books and other material both within and without the library building, the change in information medium from printed to electronic formats present new logistical challenges. Integrating environmental sustainability performance into logistics management is still a new phenomenon. Recently, Lay and Wong find that "green logistics management reflects ability to conserve resources, reduce waste, improve operational efficiency, and satisfy the social expectation for environmental protection" [2]. Similarly Pazirandeh and Jafari characterize green logistics as that "which is designed not to only be environmentally friendly, but also economically functional" [3].

The literature's key message is that green logistics is minimizing a firm's environmental impact while improving operational efficiency including cost savings and better resource utilization.

Since the 1990s, the literature on library sustainability and environmental concerns has grown and garnered much attention.

Jankovwska's review identifies four major categories of green practices in libraries: (1) Sustainability of scholarship and collections; (2) Green library operations and practices; (3) Green library buildings; and (4) Measuring and improving sustainability [4].

Libraries have the possibility to play a unique role in the green building movement. This is due to the altruistic mission and the public and pedagogical nature of libraries.

A "green" library may be a library in a "green" building; or a sustainable building. This includes careful selection of the site, and using renewable and biodegradable construction materials and products. Further, the library pays close attention to conservation of resources (water, energy, paper), and responsible waste disposal (recycling, for example). This is done with a view to minimize negative impact on the natural environment, as well as maximize indoor environmental quality, and is applicable both in new constructions and library renovation [5].

There is growing concern about a variety of factors that may threaten the sustainability of academic libraries: developing and preserving print and digital collections; supplying and supporting rapidly changing technological and networking infrastructure; providing free services; maintaining growing costs of library buildings; and lowering libraries' ecological footprint [4]. The total amount of "e-waste" generation in libraries and archives increase as results of digital preservation activities and changes in technology [6].

Traditionally, libraries consume large quantities of energy for user services and comfort, content creation and preservation. They produce considerable waste, particularly in energy, water, computer paper, and used electronic equipment [6].

In their conceptual paper Kurbanoglu and Boustany divide the way libraries may be green into several subsets: green buildings; green operations and practices; green programs and services; green information systems; green collections and collection development; and green information literacy. The authors of this paper were inspired

by Kurbanoglu and Boustany's claims about the benefits of green information literacy, and decided to test the principles on a group of students at Transilvania University of Brasov, Romania [7].

3 Qualitative Research on Green Practices and Information Literacy

In this paper we will take our starting point in green information literacy. Given the aspects highlighted in literature, we started from the H0 statistical hypothesis: there is a strong correlation between the ability to search, use ethically and communicate information, and the development of a sustainable thinking, which is green practice behavior.

To investigate this, we made a survey of students' attitudes. The surveyed population was the community of undergraduate students, masters and PhD students of the Faculty of Product Design and Environment, the study programs of Mechatronics, Optometry and Medical Engineering at Transilvania University of Brasov, Romania, in total 482 students for whom the concepts of green library, green informational system and green practices were presented.

3.1 Collecting Data Preparation

In the normal run of an Information Literacy course, the students from the Faculty of Product Design and Environment were provided with the following notions concerning the impact of internet and accessing information on the environment:

- Information systems and services are widely using ICT (information and communication technologies,) and the increasing use of ICT has a significant impact on energy consumption and emissions of greenhouse gases.
- Current reports and publications have focused on the amount of energy consumed in using ICT and internet searches. The figures might help us understand the impact of information systems and services on the environment:

  o It is estimated that a Google search generates 1g-10g of CO_2 emissions, depending on the time needed and the equipment used, and whether the equipment / computer was turned on or not, for one simple search on internet.
  o Google estimates several billion searches (about 6 billion in 2013) per day.
  o Billions of searches are performed daily to find information not only on the internet, but also in library catalogues, databases, institutional repositories, and electronic resources such as books and journals.
  o Behind each information system there is an information retrieval system which ensures access to information and, in turn, consumes energy and generates CO_2 emissions.
  o In 2010, Google's total electricity consumption was 2.26 million MWh

- It is estimated that the internet consumes between 170 and 307 GW of electricity, which is the equivalent of 11-19 percent of the total energy consumption of mankind.
- An ordinary computer operating one day (24 hours) generates 494 Kg of CO2.
- The hosting of 10MB of data generates 2-1/2 kg of CO2. The energy consumption of servers and data centers is doubled in five years. The data center infrastructure needs electricity for power and cooling. Such structures can be 40 times more active energetically than the conventional office buildings [8].

All study years participated in the research. The demographic composition of the respondents conformed to the actual structure of the study years, and also of gender (58 percent male, 42 percent female) and age-groups.

3.2   Research Methodology

After the Information Literacy course, the students were given an online survey. The research was approved by the Ethics Committee of Transilvania University.

When submitting the survey, the student agrees implicitly with the use of its data in the study *Information literacy and sustainable thinking* and that the results of the study will be used to publish a scientific article.

The survey included 10 questions, three of which were descriptive. The descriptive questions asked about age, gender and study year. Students also responded to questions on the level of novelty of the information presented in the IL course – how much of the information about "green searching" they already knew. They were asked about which information sources they prefer; printed or electronic or both. Students were asked explicitly their opinion on whether the skills acquired during the Information Literacy course could help reduce substantially the carbon emissions and power consumption during information searches. They were also asked whether finding such information change their behavior when searching for information; whether they think information literacy can shape a sustainable thinking pattern; and how much time they spend daily accessing the internet.

3.3   Results of Collected Data

In the following we present the results from responses to the questions. 335 responses were obtained, a sufficient number to validate research data for a 95 percent confidence interval and +/- 3 percent accuracy.

99 percent of the students considered the information about the energy consumption of internet searches new information. Only one student commented that he or she had discovered such information on the internet earlier.

Most students, 73 percent, prefer both printed and electronic sources of information for their studies. 10 percent prefer mainly printed, while 17 percent prefer only electronic.

After the course, 74 percent of the students surveyed agreed that information searching skills may help substantially reduce carbon emissions and consumption of electricity while searching for information.

Table 1. Level of agreement with the statement in Q5. "In your opinion, is Information Literacy supportive to develop a sustainable thinking?"

Answer	%	N
1 To a great extent	32.1	107
2 A lot	56.2	187
3 To a small extent	11.7	39
4 Not at all	0.0	0
	answered question	333
	skipped question	2

Thirty-two percent of students regarded the Information Literacy course as a determining factor in the development of sustainable thinking, and agreed that it will have a very strong influence, while 56 percent saw it as having a strong influence. Almost 12 percent of the students agreed that training in Information Literacy wields a small influence, while none of the 333 respondents said it does not have any influence at all (Table 1).

On the other hand, 17 percent of the respondents did not know if they would change their information searching behavior using the techniques learned during the Information Literacy course, while 80 percent thought that they would. The students also commented on this question. Of the 7 comments to this question, the most interesting were:

- *"I think our generation of students, adults, young people wants to search information quickly, we no longer have enough patience to get informed from books, newspapers, materials which involve us more visually."*

- *"The current trend is focused very much on multimedia and permanent internet access. I think that few people turn off their laptop/PC, because they want to instantly access internet when information is needed. "*

- *"Yes, because we save time, which can be used for other activities and tasks we have to fulfil."*

- *"Based on the information I received during this course, I can find information more quickly and accurate!"*

- *"Nothing in life is impossible and anything that can be learned can also be unlearned! The better informed one is on certain things, the more one feels the need to change old habits! I have definitely changed my information search behavior, thanks to the Information Literacy course!"*

The average time spent on the internet were four to five hours daily. The minimum reported were two hours, 3.6 percent/12 respondents, while 2.1 percent/7 respondents said more than eight hours.

4   Discussions

Information on green practices, green systems, their economic influence and environmental impact had a high degree of novelty for students. Seventy-three percent of them (242 respondents) prefer both print and electronic information sources, and 17 percent/58 respondents prefer mainly electronic. The biggest impact of the presented information will be applied upon students who use only print sources.

However, when looking at the responses from students in Brasov to the Multi-national survey on students' preferences of print vs electronic study literature presented at ECIL2015 by Landøy, Repanovici and Gastinger, there is a much clearer preference for print and not so much for electronic material among these students, who had not been presented with information literacy and sustainable searching. In the multi-national survey the preference were 66 percent for print and 22 percent for "both" [9]. The results are not absolutely comparable, since the multi-national study asked specifically for study literature. Still, they give an indication that showing students how to use electronic resources in an information literate way in itself will lead to a change of preferences, and that the preference for print and non-preference of electronic literature also has to do with the preference of the known and the non-preference of the unknown.

Students are aware that effective and safe information search skills using the strategies learned during Information Literacy courses can substantially reduce carbon emissions and consumption of electricity while accessing electronic information using the internet.

Students believe that the presentation of these concepts and the Information Literacy courses can lead to the change of informational behavior and generate sustainable thinking.

Students appreciate the concepts learned during Information Literacy course and believe that they acquired skills for their entire professional development.

5   Conclusions

Data from the survey demonstrates the students' high interest in green subjects and resources, and shows how Information Literacy can have an added contribution to the education of the young generation in the area of sustainable thinking. One way this can happen is if the courses are adopted to environmental sustainability. Students must be made aware of the ecological manner of searching, selecting, using and communicating information.

The data from the survey also shows that the students experience electronic resources as something new. When they have been exposed to the electronic resources

and sustainable information searching through the Information Literacy course, they agree that they will change their information search behavior.

References

1. Ranganathan, S. R.: The Five Laws of Library Science. Madras Library Association, Madras, India and Edward Goldston, London, UK (1931) http://hdl.handle.net/10150/105454
2. Lay,K.H and Wong,C.: Green Logistics Management and Performance: Some Empirical Evidence from Chinese Manufacturing Exporters. Omega, 40 (3), 267--282 (2012)
3. Pazirandeh, A., Jafari, H.: Making Sense of Green Logistics. International Journal of Productivity and Performance Management, 62 (8), 889--904 (2013)
4. Jankowska, M.A., Marcum, J.W. Sustainability Challange for Academic Libraries: Planning for the Future. College & Research Libraries, 71(2), 160--170 (2012)
5. Ruisheng, N.G., Low, J.S.C., Song, B.: Integrating and Implementing Lean and Green Practices Based on Proposition of Carbon-Value Efficiency Metric. Journal of Cleaner Production, 95, 242--255, (2015) DOI: 10.1016/j.jclepro.2015.02.043
6. Kim, S.: Electronic Waste (e-Waste) in Libraries and Archives (2001) http://srhkim.com/ewaste/index.html
7. Kurbanoglu, S., Boustany, J.: From Green Libraries to Green Information Literacy. In: Kurbanoglu, S. Et al (eds) Information Literacy. Lifelong Learning and Digital Citizenship in the 21st Century. ECIL 2014. CCIS, 492, pp 47--58 (2014)
8. Bennett, S: Libraries Designed for Learning, CLIR Report (2003) http://www.clir.org/PUBS/abstract/pub122abst.html
9. Landøy, A., Repanovici, A., Gastinger, A.: The More They Tried It the Less They Liked It: Norwegian and Romanian Student's Response to Electronic Course Material. Presentation at ECIL2015 in Tallinn, Estonia, October 19-23. To be published in Communications in Computer and Information Science by Springer