

PRACTICING ENVIRONMENTAL SUSTAINABILITY TO PROMOTE ENVIRONMENTAL JUSTICE: THE ENVIRONMENTAL IMPACT OF DE LA SALLE UNIVERSITY – DASMARINAS SCHOOLBOOK ON-LINE CLASS

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ABSTRACT

In His holiness' landmark Encyclical Letter *Laudato si*, Pope Francis discussed comprehensively the relationship of environmental destruction and poverty. He showed how climate change, in particular, can affect the most vulnerable to environmental changes – the poor. This showed that combating poverty and marginalization is not just a social and political issue but also environmental. In the field of education, how can climate change mitigation and adaptation be promoted in the curriculum? How can it be practiced within an institutional framework? This paper presents the environmental impact of De La Salle University – Dasmariñas Schoolbook (Educ2.0) on-line class program. Environmental impact was measured by determining the students' carbon and water footprints in both method of instructional delivery. Results showed that for a three-month period scope of study, a total of 810.50 hours were used for on-line classes and this was compared to data if the classes were given using a face-to-face mode of delivery. Results showed that on-line classes has reduced the student's carbon footprint by 71.44 % translating to 45.77 kg per class session compared to conventional face to face method of delivery. In terms of water footprint, there was a reduction of 63.95% or a total water footprint reduction of 137,421.67 liters in the last three months.

Keywords: on-line class, climate change, environmental impact, environmental education

Introduction

In the Encyclical Letter *Laudato Si* of our Holy Father Francis, the Pope discussed comprehensively the relationship of environmental destruction and poverty. He showed how climate change, in particular, can affect mostly third world countries of which majority of the population are poor – the most vulnerable to environmental changes. The poor, due to changes, are forced to leave their homes and lived in unsafe areas with great uncertainty in their future. The poor, who are the least contributors to the causes of climate change are the ones subjected to its worst impacts and creating injustices from these environmental changes. How would the Lasallian institutions respond to these signs of the times?

The United Nations Program on Education for Sustainable Development (ESD) promotes the philosophy that every human being should have the right to acquire the knowledge, skills, attitudes and values necessary to shape a sustainable future¹. This means the inclusion of crucial sustainable development issues into curriculum and teaching. Some of the key issues are climate change, disaster risk reduction, biodiversity conservation, poverty reduction, equitability, gender sensitivity and sustainable consumption. It highly encourages the use of participatory teaching and learning methods that will motivate and empower learners to change their paradigm and take tangible actions in the promotion of sustainable development. Participatory means method is learner-centered. Consequently, Education for Sustainable Development upholds competencies like pro-activeness, critical thinking, creating future implications and scenarios together with making decisions through consensus. The educator, therefore, becomes an integral facilitator in this method.

De La Salle University-Dasmariñas (DLSU-D) is at the forefront in the promotion of Education for Sustainable Development among higher educational institutions in the Philippines being recognized nationally and internationally for its environmentally sustainable initiatives. One of its flagship programs is BLACK OUT! GREEN IN! – Project Carbon Neutral which aims to make DLSU-D a carbon-neutral university. As part of its integration to global education, DLSU-D utilizes eLearning through the DLSU-D Schoolbook – an online educational tool that may be used both synchronously and asynchronously. But does eLearning promote environmental sustainability? Does it promote environmental justice?

This paper presents the environmental impact of eLearning using carbon footprint and water footprint as measuring tools. Using the DLSU-D Schoolbook program as platform, comparison with conventional classroom methods on the resources utilized was done.

Review of Related Literature

In the Philippines, the national government in 2009 enacted the Republic Act 9729 or the “Climate Change Act of 2009”. The Act recognizes the vulnerability of the Philippines to the impacts of Climate Change and therefore provided the mechanism of mainstreaming climate change in the formulation of policies, creation of programs and integration to the Philippine curriculum. The law explicitly mandates educational institutions to integrate climate change and its impact to the curriculum.

But curriculum is not just the subjects or courses taken by the learners inside the four walls of the classroom (Gruenewald, 2003), but rather it is the totality of the academic and hidden curriculum the learner imbibes during the course of his study. This means that the academic institutions’ norms, values and beliefs, infrastructure and policies are part of the learner’s education. Ecologically speaking, how the academic institution manages its resources, its consumption and its values on sustainability are part of the learner’s learning process. Taking from this, every institution like a university has an environmental aspect. The environmental aspect draws from the university’s utilization of resources which includes paper, raw fuel, water, energy, transport, food and others. From these aspects, impacts are created. Impacts like pollution, hazardous and non-hazardous waste, greenhouse gases (GHG), sewage, air pollution and the like. These impacts can be measured quantitatively by using numerous methods. Two of these are carbon and water footprints.

The carbon footprint (CF) of a school is defined as the total sets of greenhouse gas emissions contributed by the school to the atmosphere. A school contributes to climate change by its

¹ <http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/education-for-sustainable-development/>

operations coming from the use of energy, production of waste, and the use of transportation. On the other hand, a school's water footprint (WF) can be defined as the volume of water used, directly or indirectly, by the school (Chapagain and Hoekstra, 2004). Indirect water use comes from the use of products (which utilizes water to produce) and resources while direct water use comes from the use of water from drinking, washing and other personal consumption.

Methodology

Scope

The study conducted an assessment of the crucial environmental components that shape the different methods of delivery of the curriculum courses. Roy and Potter (2007) discussed that conventional and traditional method is classroom-based where face-to-face teaching that happens and learners are physically present in the campus. In this type of delivery approach, learners are required to attend physically the lectures, conduct research in the laboratories and utilize the library and consume university resources (e.g. energy and water). Also, On the other hand, eLearning platforms like the DLSU-D Schoolbook eclass utilize a different delivery method. The course is delivered on-line whether asynchronous or synchronous and the student does not need to go to the classroom or to the school to physically attend classes. The learner can conduct his or her lessons on his own time as defined by the teacher who in this case is considered as learning facilitator. This delivery partially replaces the physical production and distribution of course lessons, audio-visual materials, conduct of exams and giving away of handouts (Roy and Potter, 2007). Ecologically, the major differences in the two methods identified concern the requirements for travel; consumption of energy for the university utilities and educational tools, water, consumption of paper and other printed matter for teaching and learning (Roy and Potter, 2007).

Data Gathering Procedure

De La Salle University – Dasmariñas (DLSU-D) employs the eLearning curriculum using a blended mode of delivery. This means that a faculty can only utilize the DLSU-D Schoolbook up to fifty percent (50%) of his total teaching hours per course in a semester. For the number of hours spent online, resources used and students enrolled, monitoring is done by the Center for Innovative Learning Programs (CILP). Data from this study were provided by the University Registrar and CILP.

For the online classes study, a total of fifty (50) faculties with a total two-hundred thirty-five (235) classes were chosen randomly from the database of the CILP (Table 1). The number of students, hours of online classes, assessments given, resources provided and lessons given were noted in a three month period. Assessments were based on number of exams given on-line and resources would mean handouts, supplemental readings, lectures and other instructional materials. Since the assessments and resources are given on-line, the students were strictly discouraged to hardcopies of exams or print resources given.

To obtain information required to compare the two methods of delivery, questionnaires were developed for students using previous literatures (Pareja, 2011). The student survey obtained the following information for each course: a). Frequency, distance and mode of travel going to and from university; b). paper used for photocopying, usual number of assignments given together with exams for face-to-face mode of delivery.

Table 1. Profile data of 235 on-line classes surveyed

Total number of students	8993
Total number of classes	235
Number of lessons given	1321
Number of assessments given	1422
Number of papers saved from assessments (pcs.)	10985
Total number of resources given	760
Number of papers saved from resources (pcs.)	325182
Total hours utilized on-line	810.5

Determining Environmental Impacts

The approach used in estimating the environmental impacts of the course delivery is to use the resource flow accounting methodology using available national statistical data and scientific literatures to measure the carbon footprint of DLSU-D Schoolbook (DS) classes. In this study, the carbon footprint (CF) and water footprints (WF) of the DS classes were compared to the CF and WF if the classes were held using the conventional face-to-face mode of delivery using the methodology employed by Pareja (2011).

For carbon footprint measurement, energy consumption coming from lighting, air-conditioning unit used, photocopying, printing and multi-media used were utilized to measure the CO₂ emissions (carbon footprint), this is compounded with emissions coming from transportation and solid waste production.

For water footprint measurement, the study utilized the methodology suggested by Chapagain and Hoekstra (2008) and Pareja (2012). Computation of water footprint came mainly from savings from paper utilized and direct water use will come from use of the university facilities if classes were held conventionally using pre-computed data (Pareja 2011).

Results and Discussion

Performing the methodology provided, CF and WF were computed based on standard procedures. Based on data gathered, Table 1 provides the pertinent data of two hundred thirty-five (235) on-line classes. These were compared to possible materials (e.g. paper) and resources (i.e. energy, fossil fuel and water) if the given 235 classes were given face to face. Carbon footprint was based measured carbon dioxide emitted by the process and water footprint was based on the sum of the direct and indirect water utilized in the whole process.

Carbon Footprint and Water Footprint of on-line classes versus conventional Delivery

The results of the energy consumption and its corresponding greenhouse gas emission value are shown in Table 2 and Figure 1. Greenhouse gas emission was measured through the measured carbon footprint of the activity.

In terms of carbon footprint, the study found out that there was a 71.44% decrease in the greenhouse gas (GHG) emission of students employing the DLSUD Schoolbook (on-line class)

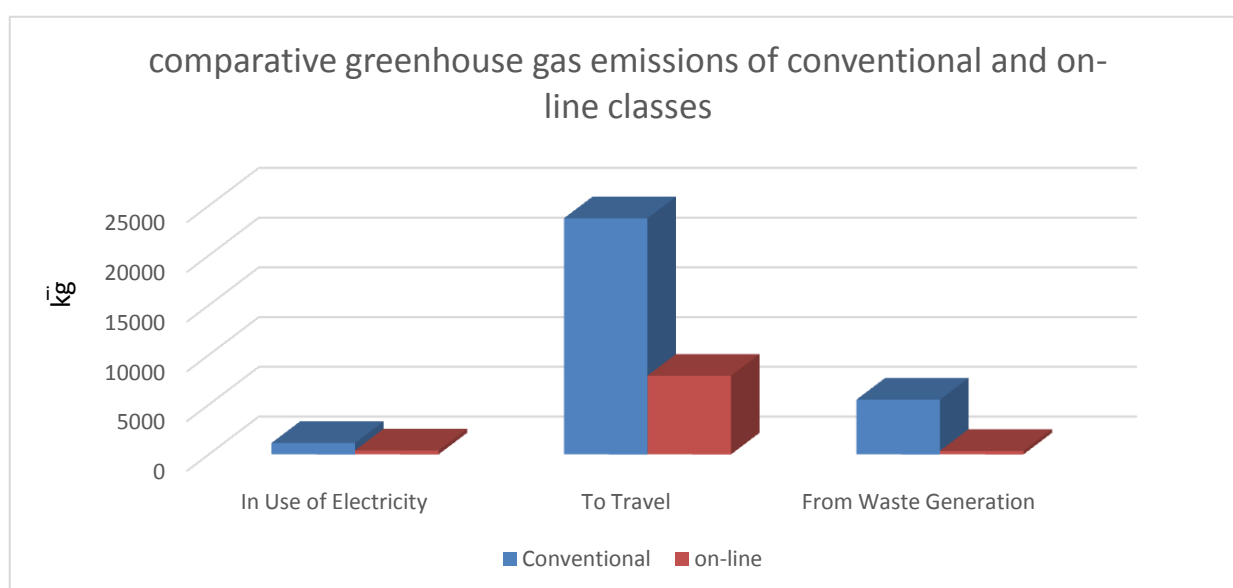
compared if the course was given using conventional method of delivery. The biggest reduction was from the generation of waste (93.33% reduction) and transportation (66.66 % reduction) going to and from the University if the student will attend a face-to- face class. 59

Table 2. Comparative Greenhouse Gas (GHG) emissions produced from using face-to-face and on-line classes method of delivery in the 235 classes surveyed.

Carbon Footprint Produced from activities (in kg)	Using face to face	Using on-line	% difference
In Use of Electricity	1146.01032	406.32556	64.54
To Travel	23741.52	7913.84	66.66
From Waste Generation	5503.716	359.72	93.46
TOTAL	30391.24632	8679.88556	71.44

The 71.44% difference or the 45.77 kg per student carbon footprint decrease in the utilization of the student's over-all carbon footprint when attending classes. This means that doing on-line classes at home compared to a face-to-face method in the University promotes more efficiency in the use of electricity and reduction of greenhouse gases which contributes to global warming.

Figure 1. Comparative greenhouse gas emission (in kg) of students using Conventional and on-line (DLSUD Schoolbook) methods of delivery of the 235 classes used in the study.



The difference may be due to several factors:

1. The reduction in travel to and from the University;
2. Reduction in the utilization of University utilities and production of waste;
3. Utilization of more efficient equipment (e.g. laptops and tablets) and reduction in the production of paper and handouts

Water footprint was computed based on the utilization of water directly and indirectly. Direct water consumption comes from the use of University utilities like water closets, sinks and utilization of water for cleaning of facilities while indirect water use came from freshwater saved in lieu of the

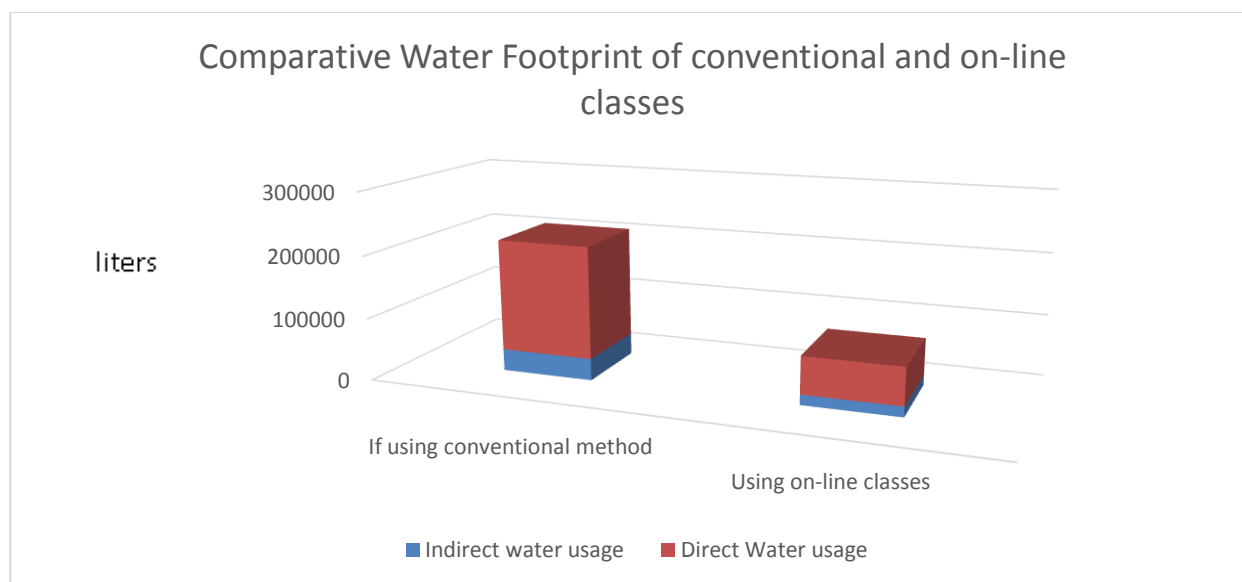
reduction in the use of paper. Indirect water use is based on the amount of freshwater inputs in the production of the product (i.e. paper). A reduction in the use of paper by the activity would mean a reduction in the water footprint of the activity. Table 3 and Figure 2 show the water footprint of on-line classes *vis-a-vis* if the classes were conducted using conventional method of delivery. 60

Table 3. Comparative Water Footprint of on-line classes vis-à-vis if the course was given conventionally for the 235 classes.

Water Footprint of the activity (in liters)	If using conventional method	Using on-line classes	% difference
Indirect water usage	35030	16503	52.89
Direct Water usage	179860	59953.33	66.67
TOTAL	214890	77468.33	63.95

Results have shown that there is a 63.95% decrease in the student's and subsequently the University's water footprint. This is due to the significant reduction on the utilization of paper and the reduction on the use of the University's utilities. This does not include the impact of providing the course syllabus online. For the University, this translates to 137,421.67 liters of direct water saved in a three-month period.

Figure 2. Comparative Water footprint of Students using on-line and Conventional Method of Delivery of the 235 classes



Data showed that doing on-line classes at home compared to having face-to-face classes in the University decreases the student's general water footprint in the activity by almost 64%. This contributes generally in the significant reduction of the use of valuable freshwater in the conduct of the activity.

In general, the University was able to save from the 235 classes surveyed a significant reduction in its carbon and water footprints in the conduct of its classes for its more than 12,000 students. A shift

to blended courses in other classes may be promoted by the University and utilize its savings to promote sustainability of its other programs.

The environmental impact can be translated economically and would therefore show that in the long run environmental impact reduction can also mean reduction in the cost of using on-line classes. By practicing and implementing environmental sustainability, the University is able to contribute to the general advocacy of reducing cause of climate change and in the long run promote environmental justice.

The study recommends the conduct of an assessment on the general consequence of shifting towards electronic teaching in terms of the use of electricity and generation of e-waste through a life cycle assessment.

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