

AN INTERDISCIPLINARY LEARNING APPROACH TO ECOLOGICAL BUSINESS: USING EXAMPLES OF BEST PRACTICE*

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Case study

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Abstract

It is a widely held view among educationists that the most effective way to facilitate a holistic learning approach is to present visual, ready-to-use, practical examples. Thus, our study follows the general scope of the course “Socially responsible ecological business”, which is currently offered to master students at the Vilnius Gediminas Technical University (VGTU). We contend that teaching materials should be presented visually using case studies and examples. Indeed, simple guidance is one of the vital

learning tools for students. Accordingly, and in line with the aims of the course, the observations and experience of differences in global culture and our inclusion of a wide range of ecological examples were central to the design of our international case study. In particular, students found the case study on ecological business both useful and applicable in the real world.

Keywords: *business skills; design practice; ecological business; interdisciplinary approach.*

1. INTRODUCTION

Teaching master students studying ‘Ecological Business’ is considered to be extremely valuable in the area of Ecological

Culture and its related learning processes. According to Sipe (2020), ‘Ecological Business’, with its obvious parallel to the transformative vision of Ecological Economics, is useful to describe this

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popular business paradigm. It is more accurate denotatively than 'green business' or 'sustainable business', because it explicitly acknowledges the ecological nature of all business activities. Unsurprisingly, teachers use an interdisciplinary approach to provide master students pursuing ecological studies with different tasks and self-improvement processes (Vallet et al., 2013). It is customary for lecturers to use case studies to provide their students with examples of leading ecological production and technologies used in ecological design, as well as to strengthen their ability to evaluate products that can be recycled (Luttrop & Lagersteld, 2006).

The authors conducted a hands-on research on the course 'Ecological Business'; specifically a research on how the improved pedagogical and practical processes determine the study experience in the final stage of students' projects. To this end and to fulfil "The Ten Golden Rules" (Luttrop & Lagersteld, 2006), the above-mentioned process is regarded as a practice-accumulated reinvention of ecological products.

The authors agree with the assertion by Luttrop & Lagersteld (2006) that master students and their lecturers engage in a series of brainstorming sessions, as project teams seek to implement different processes. This process redirection transforms the practice, possibilities and behaviours of students included, as well as the pedagogy itself when working towards acquiring knowledge. Further, it leads to useful results and provides a hands-on experience that can be used as a process, as well as a demonstration of what is practically possible (Valentukeviciene & Rynkun, 2016). Note that hands-on refers to the "mentor guidance" that the students use in self-improvement and which allows them to relate different tasks to a process and implement

them (Charnley et al., 2011). However, to achieve this, they must first develop an appropriate process design. Hence, at the Ecological Culture and Ecological Business courses of study, in addition to the practical experience provided, process learning is also used as a tool for teaching students that should eventually lead them to start-ups, based on ecological production.

To date, limited research into the lecturing process in the study of Ecological Business as an academic subject (Lofthouse, 2006; Bergea et al., 2006; Luttrop & Lagersteld, 2006; Karlson & Luttrop, 2006) has been conducted. Scholars have spent a great deal of time lecturing master students on how to use different processes and certain study processes are universally accepted (Timothy, 2020). Some survey-based studies recognize the connection between the way processes are carried out and the quantity of ecological production (Allione et al., 2011). However, they do not investigate why Ecological Business students select certain processes over others.

To address the different issues in teaching the course 'Ecological Business', our research was conducted in two stages. Firstly, the state-of-the-art processes carried out in this subject area were identified by evaluating how ecological practice (dealing with an ecological process, used to educate the students) is applied in ecological production.

Luttrupp et al. (2006) agree that studies are usually conducted on integrated and complex Ecological Business projects, suggesting that students should merge environmental aspects, based on general studies, in order to guide the ecological business development. Our research identified how master students tried different brainstorming and brainwriting techniques (writing

down some interesting ideas exchanged during teamwork and classroom discussion). Researchers argued that understanding how businesspeople understand the use of special processes could help adapt these processes to the work of designers and enable the transfer of knowledge about profits, frames and planning processes to 'Ecological Business'.

Our research addresses these issues, offering practical advice on the processes, carried out in the 'Ecological Business' classes. We note that some of the current literature has focused on appropriate methods, used by ecological businesses to apply processes in a progressive way, in order to improve and develop their ecological production (Arana-Landin & Heras-Saizarbitoria, 2011; Costanza et al., 2018; Costanza, 2020). Our results offer suggestions for improving the relationship between the processes applied, on the one hand and students' social and ecological perceptions, on the other. We demonstrate that, when an appropriate process is applied, students become less inclined to waste their time. The improved levels of interest and engagement were observed, which, in turn, helped to reduce disagreements and with lecturer-provided guidance, students improved their self-development at each stage. This practical pedagogical experiment (Valentukeviciene et al. 2016, 2019) enabled us to contribute to improving knowledge transfer in a practical and interesting way, and to show students why the study of 'Ecological Business' is relevant and valuable.

Secondly, each semester feedback from students taking the course at VGTU was monitored and comments provided by both the local Lithuanian and foreign students were analysed. Feedback was asked for the following activities: visit to the eco-textile

production company, JSC "Omniteksas" (Kaunas, Lithuania), visit to the ecological restoration places at the lake resort (Trakai, Lithuania) and a virtual tour of the Ecological Studio in the garden near a residential house in St Ives in New South Wales, Australia.

Based on our evaluation of how students react to their local and international ecological experience, we believe that our findings offer new perspectives in ecological education, especially for master students.

2. THE PEDAGOGICAL EXPERIMENT: MAIN METHODS AND PROCESSES

The idea for an ecological business project (hereinafter referred to as the 'project') for the second-year Master's degree study programme was initiated by the study programme "Environment Protection Technologies and Management" Committee at the VGTU, under the supervision of a panel, consisting of lecturers, with master students as team leaders. Accordingly, the project is based on the analysis of the site visit report (hereinafter referred to as the 'report') a virtual eco-studio tour, all of which was finalized by a self-study process during the autumn semester. In addition, further information obtained during the visit (excursion) to eco-production sites before the end of the semester is included. Hence, both the lecturer's observations and students' opinions enabled us to adapt different courses that focus on creating a more sustainable economy through zero waste.

Having examined the various tasks and skills required for various courses, they were adapted as a common solution that can be applied to different course types. For example, the master course combined

elements that were functional, topical, situation- and task-oriented, and which required different professional skills and/or an analysis. It follows that the application of skills will need to be flexible, if they are to respond to real-life situations. It must also be taken into account how students respond to fulfilling those tasks. Thus, it is of utmost importance that none of the elements dominates, as each element needs to be adjusted, so that it can be integrated with others. The final result is always a compromise between the competing claims of different organizational elements.

The purpose of the field trips was to capture different perspectives on the study process and, for this reason, they included meetings with the key persons (our social partners) at the VGTU. The following personnel were involved: the production director of the JSC “Omniteksas” (2 academic hours); a professor responsible for the study programme (64 academic hours of theory, plus exercises); and other stakeholders, including graduates and potential employers. In addition, five to six person teams of second-year master students had to study the eco-studio virtual tour guide (8 academic hours).

Each team evaluated various facilities, such as hands-on training, virtual video, computer equipment and laboratories, with all teams reviewing and evaluating each other’s work. Then followed a discussion and additional preparations, in order to draw conclusions and make additional remarks. Next, preliminary general conclusions of the process were presented. Finally, the students agreed on the content of the annual report, which represented the conceptual views of student teams.

The Study Committee, in close cooperation with student representatives, worked intensively on the study evaluation

procedure, which provided timely improvements and developed novel methods. The knowledge of ecological processes should assist future professionals to achieve advanced skills in ecological production and management by providing competencies required for business studies. In addition, their involvement will enhance their employment prospects in the fields, such as education, ecology/environmental studies in state, commercial and non-governmental organizations, dealing with environmental issues and their successful management. Building these specific skills will also assist those, seeking a career in various governmental institutions in the environmental sector (at the state or self-government level), and/or those who wish to start their own business in the field of environmental management.

Thus, the aims of this pedagogical experiment and its focus on a specific process were to:

1. Satisfy market demand for professionals in the field of ecological production and its management;
2. Provide opportunities for master students to receive an integrated education in ecology and nature management;
3. Further disseminate and communicate environmental requirements and attitudes to students;
4. Continuously improve study quality by taking into consideration changing economic conditions pertaining to ecological activities, the demands of students and society, as well as international requirements.

The authors consider the aims to be pedagogically sound. The authors also focused on the competitive labour market and

students' scientific, environmental and social needs. Our intention was to assist the students, looking for opportunities in the workforce, as future specialists with integrated competencies. The process aims to integrate a large variety of study fields with the expressed aspect of applicability. All participating students showed a great interest in adapting eco-studio design to meet the needs of the European market. Indeed, they were able to improve interdisciplinary approaches in the process of eco-design, e.g. noise insulation possibilities, energy efficiency, design advances for the benefit to the consumer, and the area of the fine arts. To this end, five students from France investigated noise insulation ('Eco-wool'), five students from Lithuania investigated 'Eco-textile', and another Lithuanian team investigated fine arts design ('Eco-corks'). All global and Erasmus exchange teams (Lithuania, France, South Korea and Laos) investigated and evaluated efficiency of the product assigned to their group. The results were as follows: ecological wool residuals were adapted for noise insulation and some improvements were observed in the heat exchange issues, and energy efficiency was increased by using ecological paints in light and dark colours. Reused corks from a winery, reused textile residuals and ecological wool residuals were also the result of the investigation process. In addition, the 'Eco-corks' and 'Eco-wool' teams were involved in fine arts design, by using brainstorming and brainwriting techniques, as well as drawing on the younger users' responses to a short questionnaire, distributed via a virtual home video, accessed via Facebook.

Students then conducted a SWOT analysis (taking into account the strong competition that exists in the European market) to achieve the best outcomes for the improvement and development of an eco-studio design. For example, based on the virtual

market research, students distinguished two essential steps of an effective market research in the eco-studio design:

Step 1 – check to see if the product is already certificated on the market.

Step 2 – conduct a survey to determine the levels of user acceptance of the product, as well as identify customer preferences, i.e. colour, size and shape of the product.

These steps are followed by the production stage and certain rules had to be obeyed. Official documents with strict requirements for ecological design were explained using simple and easy to understand examples. By the end of weekly presentations, all students were asked to provide feedback, with examples of an ecological design from their own country or with examples they were able to draw from their international studies experience.

3. ECOLOGICAL STUDIO CASE: SYDNEY VIRTUAL TOUR

A virtual tour to an existing ecological studio was proposed and arranged by the designer Craig Young-Anand from Sydney. Young-Anand holds that his experiments with purpose-built studios came about from his desire to create an atmospheric environment, using everyday household elements that could be recycled, regardless of their previous life. In short, his aim was to create a studio that had little impact on the environment. Moreover, it had to be easy to assemble, disassemble and transport. First, Young-Anand conducted a SWOT analysis, which identified certain advantages and disadvantages of popular variants of the studio he had in mind.

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Table 1. SWOT analysis

1. Countryside studio: Advantages and disadvantages	2. Suburban garden studio: Advantages and disadvantages
<p>Advantages:</p> <ul style="list-style-type: none"> • Environment friendly. • Better air quality. • Silent surroundings. <p>Disadvantages:</p> <ul style="list-style-type: none"> • Long commute to/from the countryside location. • Summer heat and wildlife. • Surrounding fields become a muddy bog during wet weather. • Bitter cold in winter. • No insulation in walls, floors or ceiling. 	<p>Advantages:</p> <ul style="list-style-type: none"> • Time saving. • No further monthly rental payments for the leased space. • No interference from other artists in creative time. • No waterlogged fields during winter months or extreme heat during summer months. • No distractions whilst working on paintings. • Easy access to the studio, including delivery of art materials and removal of finished works. <p>Disadvantages:</p> <ul style="list-style-type: none"> • Working from a home-based studio, friends/people interfere with the creative process. • Family-based activities take away time from work. • Assembling the structure alone. • Yurt must fit together perfectly. • Council Inspector, by law, required to make routine inspections to ensure structure is of correct building standard and not likely to cause injury to anyone with close proximity. • Upon completion, a certificate of compliance to be issued by the Council Inspector. • Alterations of second-hand sheds increased inherent problems associated with the pre-existing structure. • Limited storage space. • Workspace can easily become a dumping / storage area.

Based on the SWOT analysis, Young-Anand set about designing his own concept of a creative and unique space located in a garden suburb, to be built from second-hand materials, with the emphasis on eco-design. The main ecological characteristics of this studio are as follows:

- *Use of recycled doors* – By building the eco-studio entirely out of recycled doors and with no traditional substructure or framework, the studio space would have a very limited life, as eventually the doors would absorb water, causing wood rot of joints of each door, threatening the entire structure to weaken and collapse, with its continual exposure to the natural elements. However, by using the doors as exterior wall panelling (a skin of the studio),

the framework and foundations would bear the weight, giving an infinite life to the doors and ensuring less maintenance for many years, according to designer’s considerations.

- *Electric power dispensed with* – Electricity is not required, as designing and painting are only performed during daylight hours, thus eliminating the need for any lighting.
- *Use of second-hand and discarded building materials* – Low-cost reused materials were salvaged from discarded timber, e.g., timber and glass doors were collected from the side of the road. Bricks for the foundations were sourced from a brick recycling company. Second-hand hardwood joists and bearers were selected to form the

basis of the building, as well as lighter recycled timbers to construct the framework.

- *Protection against the Australian summer sun* – Climatic conditions in Australia during summer can be extremely hot, with temperatures rising to more than 40°C. The sun transits from East to West. However, coming from a northern axis, it casts a shadow, so that the shade sits on the Southern side of any structure. For maximum protection from direct sunlight, four doors on the northern elevation needed to be solid timber, without glass. On the eastern elevation, to permit the morning sunlight to enter the space, three doors with half-glass would address the light and provide stability. The southern elevation, which is the shaded side of the studio, would need at least four half-glass doors to reflect light back into the studio. The western elevation required solid timber doors to help block the harsh summer sun. However, one door hinged to open, to allow cross ventilation.
- *Roof pitch* – The necessity of a slight sloping roof to deal with rain. No gutting was required and the water run-off needed to be on the southern side, as the site falls away toward the south. The rainwater run-off is collected in the manmade frog pond at the bottom of the garden for water reuse in irrigation.
- *Environmentally friendly paint finishes* – the studio's owner browsed the Internet to find locally manufactured paints that had a minimal impact on the environment, were non-toxic, and did not require chemicals for the cleaning of brushes or paint rollers. "Green leaf" labelled materials have no harmful effects on the environment.

Unfortunately, they have the highest costs on the market and are usually produced in small quantities, because of a short lifetime. The brown colour would also absorb and preserve heat in the cool winter months, as the lower sun would have a direct contact with the exterior walls, helping to heat the studio, as the winter temperature drops. During summer, the sun sits much higher and the roof of the studio, plus the surrounding garden vegetation, helps to protect the walls, thus creating a cooler environment within.

- *Future use of plants to insulate the roof* – Built from second-hand materials, the studio has little impact on the environment and future plans were related to the possibility of using succulents as insulation on the roof, growing them in commercial cardboard egg containers. Cardboard would eventually break down, by which time succulents should have established themselves.

The Studio has now been standing since 2010. The interior is still in good condition, and needs little painting or maintenance. The exterior is also in good order, although as of 2020 it needs to be freshened up with a new coat of paint.

Students, participating in this learning experiment, were acquainted with the general rules of ecological design and made a virtual tour of the above-mentioned studio. After discussions within small groups, they provided some reflections on designing and building an ecological studio. They offered the following advice:

- Do not use toxic substances, only ecological paint;
- Minimize energy and resource consumption to make insulation, use renewable solar energy;

- Minimize energy and resource consumption (in the usage stage);
- Promote repair and upgrading, in particular the handmade repairing;
- Invest in better materials, use compact wool residuals;
- Use biodegradable materials;
- Prearrange upgrading, repairing and recycling, reusing parts of residuals that are not broken;
- Promote prearranged upgrading, repairing and recycling by using simple, not blended materials;
- Use as few joint elements as possible, according to the life cycle scenario.

The students have also conducted a SWOT analysis of the improved eco-studio design (Table 2).

Table 2. SWOT analysis of the improved eco-studio design

<p><i>Strengths – advantages</i></p> <ul style="list-style-type: none"> • It is a good example of recycling materials; • It encourages users to sort their waste, giving it a possible application; • Every eco-design studio is unique; • It is fashionable to use ecological products. 	<p><i>Weaknesses – disadvantages</i></p> <ul style="list-style-type: none"> • Insulation based on eco-wool residuals does not protect from the water condensate.
<p><i>Opportunities</i></p> <ul style="list-style-type: none"> • Eco-wool residuals make a big part of waste that remains after the eco-textile production stage (more than 30%); • Easily collected ecological textile; • Using some recycled textile. <p><i>Threats:</i></p> <ul style="list-style-type: none"> • It is not a first need product; • Raw materials are available to everybody; • Users can be afraid of and not ready for innovations. 	<p><i>Possible threats - comparison with others competitors</i></p> <ul style="list-style-type: none"> • With the Internet: there are a lot of people all around the world who make mobile studios to sell: <p>→ It is necessary to be competitive by proposing prices similar to the existing ones;</p> <p>→ It is also necessary to be more creative.</p>

Nowadays, ecological products are recognized more and more, usually because of their easy entry into the market. For the eco-studio chosen for this paper, several issues need to be addressed. Firstly, the “Ten Golden Rules” give us the guidelines to follow. Secondly, the SWOT analysis allows us to realize the possibilities, difficulties and opportunities that present themselves.

4. ANALYSIS AND DISCUSSIONS

The European Commission has expressed an interest in a broad

interdisciplinary significance of educating students in eco-business and moving the process(es) into the management context. However, despite an increasing emphasis on an interdisciplinary approach, several eco-design projects still appear to be technically specific and lacking a sufficient breadth of context, as well as an environmental perspective, a case in point being ‘Eco-carpet’, which was implemented by a team of Lithuanian students. Hence, the committee that oversees the study programme recommends extending the number of integrative courses, such as ‘Environmental Accounting’, which can be provided on request by the Faculty of

Environmental Engineering at the VGTU. This course is oriented towards assessing environmental impact, etc., and is not a specialized subject. It should also be noted that the programme is highly internationalized and there are students from all around the world, e.g. students from both the EU and non-European countries, as well as lecturers from Belarus and Poland, who participate in VGTU's courses.

During the experiment on which this article is based, a review of the current state of the ecological business network in the ecological production industry in the EU was carried out. Based on different case studies examined, certain improvements were made to the eco-design processes. Relevant topics were chosen, based on the need to maintain the sustainability of international exchange network in participating 'green' universities. The experiment determined the reasons for and the trends of study quality changes, as well as detected areas where the study process could improve its quality. The results of experimental analysis were presented from the perspective of sustainable development and assessed in the light of sustainable ecological business. Then, a certain model of actions was suggested. This model helps to structure the ecological content of the project design for further improvement of the applied studies' quality and interdisciplinary approach.

5. CONCLUSIONS AND RECOMMENDATIONS

Firstly, notwithstanding the recent emphasis on interdisciplinary approach, some ecological business projects still appear to be technically specific, lacking a sufficient breadth of context, as well as a clear environmental perspective. The authors

recommend the implementation of the abovementioned study programme in new integrative courses, such as ecological economics, environmental impact assessments, etc., rather than more specialized subjects. Furthermore, the internationalisation of the programme could be improved by better utilising the exchange facilities available to students and lecturers, thereby promoting staff mobility and a greater inclusion of lecturers with experience and perspectives from other countries. The term 'Ecological Business' is broad; notwithstanding, a redefinition of the existing course title, 'Ecological Design', is suggested, as to reflect the wider European attitudes to green and sustainable businesses that are integral to environmentally responsible businesses.

Secondly, despite the general tendency to increase elements of interdisciplinary approach and management in the study process, some study courses are still narrowly specific, e.g., 'Ecological Business' in the Environmental Engineering programme. We recommend replacing those specialized subjects with the above-mentioned integrative courses, in order to achieve a higher degree of consistency between the course content and the type and level of studies. Some courses should be continued in international classes to further contribute to the internationalisation process of the eco-design course, and they should include more practical elements. We also recommend making the study process more flexible and offering it to part-time students.

Finally, lecturers should be encouraged to take a more active part in the scientific work, to improve their scientific qualifications, strengthen their international relationships, participate more frequently in the international conferences, and publish more articles in international journals. Lecturers should also encourage their master students

to read more extensively, especially the latest research published in highly ranked international research journals.

In the short term, the lecturers should focus on:

1. Increasing the amount of time spent on studying the process followed in each of the case studies, including elements of the study process based on practical exercises (laboratories and / or eco-production points);
2. Inviting suitably qualified guest lecturers from abroad, as well as from the other Ecological business and / or Eco-production factories;
3. Encouraging students to take a more active part in international study exchange programmes;
4. Attracting more international students, which will boost the demand for Eco-design courses and its potential impact on the number of future exchange students wishing to enrol.

With the general results of the research in mind, it can be categorically stated that there is no unique study material that ensures sustainability of an ecological business. We strongly suggest that engineers take on more responsibility when designing ecological products. Hence, in order to choose the most suitable study material, the attitudes towards technologies need to change and a more sustainable point of view needs to be embraced. By choosing the best case study example for an ecological business, it is important to follow a sustainable development policy, i.e., to evaluate the quality of student life and the life cycle of ecological products they use. Further research into these factors would improve the sustainable development of

eco-design studies, as well as develop the correct attitude towards a globally sustainable environment for everyday living.

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**INTERDISCIPLINARNI PRISTUP UČENJU
EKOLOŠKOG POSLOVANJA: KORIŠTENJE
NAJBOLJIH PRIMJERA PRAKSE**

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Sažetak

Široko je rašireno stajalište obrazovnih djelatnika da je najučinkovitiji način koji omogućava holistički pristup učenju predstavljanje vizualnih, praktičnih primjera koji su spremni za upotrebu. Naše istraživanje prati opći sadržaj kolegija „Društveno odgovorno ekološko poslovanje“, koji se trenutno nudi studentima diplomskih studija na tehničkom sveučilištu Vilnius Gediminas (VGTU). Tvrdimo da bi nastavni materijali trebali biti predstavljeni vizualno koristeći studije slučaja i primjere. Jednostavno usmjeravanje jedan je od ključnih alata za učenje. U skladu s tim i u skladu s ciljevima kolegija, zapažanja i iskustva razlika u globalnoj kulturi te naše uključivanje širokog spektra ekoloških primjera bili su presudni za kreiranje naše međunarodne studije slučaja. Studenti su smatrali da je studija slučaja o ekološkom poslovanju posebno korisna i primjenjiva u stvarnom svijetu.

Ključne riječi: *poslovne vještine; projektantska praksa; ekološko poslovanje; interdisciplinarni pristup.*