Sustainable development: ten years of experience at ITESM’s graduate level

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Abstract

This paper presents the experiences of a multidisciplinary team of professors during the design, implementation and evolution of a core course on Sustainable Development, at the graduate level for all Masters programs within the Monterrey Tec System (ITESM). During the last ten years, the SD course evolved and we tried several teaching techniques, methods and platforms from a traditional classroom to a distant teaching/learning, up to an on-line course. The most important changes have been the content and the impact of the course upon the personal and professional lives of the students. Initially it was mostly an informative course about the most important environmental issues and their social and economic consequences. The next step evolved to a mixture of informative and formative course with a holistic approach. Nowadays, the students leave this course as empowered ‘agents of change’ knowing how their everyday actions and choices have an impact on the environment, our society and the well-being of the future generations.

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1. Introduction

Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM), as well as offering a high level training of human resources in specialized areas, has undertaken an endeavor, the challenge of education from a global perspective as the foundation of tomorrow’s professionals. As the global environmental problems and concerns grew, higher level administrators at ITESM foresaw the need for the alumni to be prepared and meet the challenges of the new millennium, regardless of academic background or future career path. When the effort for a sustainable development course began, the Rio Summit had just taken place and the Declaration on Environment and Development and Agenda 21 had just occurred. Following with the academic tradition, ITESM saw the inclusion of these topics in the academic curriculum, as part of the cornerstone in preparing tomorrow’s professionals.

In 1993, the ITESM authorities asked a small group of professors to put together a syllabus that could bring the attention of students to a new axis of movement and bring them to the center concerns of sustainable development. In this paper, we present the experiences of a multidisciplinary team of professors during the design, implementation and evolution of the Sustainable Development (SD) course at the graduate level within the ITESM’s System.

2. Why teach SD to graduate students?

The main interest was to prepare a curriculum that would help to develop awareness within the students regarding the actual state of the planet and how every decision, taken as
individuals, professionals, or citizens, has an impact on the environment. The idea was for the students to realize how every day, big and small choices impact upon the conditions of the planet in which present and future generations will live and because they are entitled to a healthy and productive life, we need to re-think our way of living and take actions without endangering the physical and biological basis that sustain life in our planet.

In Mexico, in 1990, only 0.054% [1] of the total population [2] had the privilege of attending a graduate school (43,948), and very likely, these alumni will become the decision makers in their homes, industries, schools and government. ITESM at Campus Monterrey had 10,382 graduate students [3], almost one quarter of the total graduate students in the country. Therefore, the need to infuse the philosophy of sustainability within this sector of the population was viewed to be a very urgent and long overdue project.

3. How did we get started?

During the fall of 1992, a small course on SD was taught via satellite. Half of the course included topics on values and the other half on ‘global environmental issues.’ This was the first step toward the teaching on SD at ITESM.

The course that preceded the SD was a compulsory course on ‘values in the profession.’ The main objective, as with other compulsory courses at ITESM, was to reinforce the students’ values and skills such as honesty, group work, etc. that potential employers would consider important for their future employees.

The 12 faculty members that comprised the first SD faculty group included: biologists, agronomists, psychologists, engineers, sociologists and economists, and some of them were teaching the course on Values. All of them had as the common interest, to teach a course where the students could visualize and incorporate the concepts of Values into their everyday lives. During three months we had regular weekly meetings where we discussed the similarities and differences between the course of Values and the philosophy, objectives, goals and syllabus of the SD course. Although it was not an easy task, in the end we all agreed on the contents of this new compulsory course. We named it ‘Values in Sustainable Development.’ The first year it was to be taught as a hybrid, with the old ‘Values’ course during the first half of the semester and the second half to be devoted to topics on SD.

In the beginning, we all agreed that the challenge was to ‘form and inform’ about the impact that only one species had inflicted upon the whole planet, without being either ‘Malthusian or Comacopian.’ The task of reaching students—already adult professionals—with the importance of the environment and to catch their whole attention without having them think that the course was worthwhile, was not an easy task. Most of all we emphasized that any decision during our everyday lives at home, school, or work has an impact on the environment, has an impact on our social circle and on the economy—private, industrial or governmental sectors. With this effort, the new compulsory course of Leadership for Sustainable Development was launched at ITESM, at the System level in 1993.

4. The first of its kind

At this point, this course represented the first course on SD in the whole continent at the postgraduate level. Because we were concerned about reaching the students, we did an exhaustive search for some other formal courses. We contacted and visited several universities, talked to professors in the USA and Latin America, so we could exchange experiences that could help us. We did not find anything like our course. In retrospect, as our international colleagues had mentioned, we can proudly say, without hesitation, that this course was the first compulsory SD course at the graduate level on the whole continent. Soon afterwards, as we all know now, similar courses were introduced at many Universities, worldwide.

5. Didactic techniques

Some of the didactic techniques used at different stages in the course are described below.

5.1. Discussion seminar

The first approach was a seminar type context, where students were given a relevant article to read and to discuss it in class. At that time, the Scientific American Magazine had devoted a whole issue in November of 1989 on several topics that dealt with the state of the planet. Because of the great demand for these articles, the Scientific American editor put out a book [4] that included these research papers; we adopted it as a major reference source. It was informative and served as the foundation for the course; however, the professors brought additional information to help the students to understand and broaden the concepts addressed in the main reader. Soon after, we realized that linking all these issues with our everyday lives was very complicated, because of the wide variety of backgrounds of the students. Their reality was somehow distant from these topics. Although students were required to ‘bring down to earth’ how each person was responsible or contributed directly or indirectly to the reality that was brought up by the literature we discussed; this reality did not reach their daily lives. The professors struggled through these challenges and made changes to make the course more didactically interactive.

5.2. Role playing

As case studies were selected, each week we devoted at least one class session to the students playing different roles in the cases. The students became more aware of the possibility that some of the issues discussed could become part of their lives. We found that this technique was most useful with groups in a classroom than with distance learning, where the interaction between students was limited by the actual technology.
5.3. Analysis of published articles

As part of our teaching strategies, the students were required to bring an article from a magazine, newspaper or some other public literature with a brief summary about how something from it addressed the topic studied during that week. The students had to analyze the article from a sustainable development point of view.

One year after we taught the ‘hybrid’ course, it became imperative to devote more time to the SD components and the latter became a full 12-credit course (as any other course of their specialty), but remained as a compulsory course for all the Masters programs within the Campus Monterrey.

6. Distant learning

Because of the diversity of topics that SD addressed, soon it became necessary for the faculty members to specialize in a specific topic and to learn more about the other issues of sustainability. These specializations were necessary to be able to provide sound lectures and to lead fruitful discussions with graduate students who were already quite informed on certain topics. Therefore, the professors that were more familiar with the ‘specific issues’ from social, economical or ecological aspects were asked to prepare one or two in-depth sessions. The specialists began preparing the lectures, reading materials, activities, etc. At that time, the distant learning method had just emerged, so we incorporated ‘remote’ lectures broadcast to each classroom (by each specialist and sometimes we invited personalities of great reputation in their fields), and the other professors who were the facilitators on that theme, themselves were learning more on that specific topic. There were up to ten groups with 35 students in each group in Campus Monterrey, plus the group from the Virtual University. Initially, there were less than 100 virtual students.

7. The Virtual University

As the Virtual University grew, the demand of the virtual course grew both nationwide and internationally. The course was broadcasted to 33 campuses in Mexico and to six other countries: Peru, Panama, Honduras, Colombia, Chile and Argentina. On average, we had around 360 students per semester. Since 1995, we have been teaching this course mainly via the Virtual University (Fig. 1). A major adaptation of the course was done in 2001 to include more web-based activities, like collaborative learning, reading of articles and case studies, watching video clips, etc.

During the 10th year review of the course, since it first became available at ITEM, it was clear that we could use new technological tools that had become available during the last few years and make the course material more accessible to students and depend less on the fixed schedule of the class sessions derive the benefit of the course. The essence of the course remained, however the kind of material became more didactic (videos, on-line games, animations, etc.) and the availability of the reading material became more effective. In January 2002, a whole, redesigned version of the SD course was made available fully on-line via the Web. This project was done with the support of the authorities at ITESM.

8. Teaching aids

As stated earlier in this paper, we started with the Scientific American book on Managing Planet Earth [4] as a basic reader for the course, but as more and more books and articles were written on SD during the last decade, it became possible to update the literature and the topics became more understandable by the non-specialists.

During the next two semesters, we incorporated more books like Changing Course by Schmidheiny [5], GAIA, An Atlas of Planet Management [6], work by Meadows et al. [7], etc. However, as time passed, an enormous amount of bibliographic sources available on the Internet became available, such as information from The World Watch Institute [8] and from the World Resources Institute [9], among others, that were integrated into the literature of the course.

Later on, we put together a collection of lectures for the students that became well known as the ‘two bricks’ that the students had to go through for this course. We, as the professors were very eager for the students to learn about all the topics related to the new philosophy on SD and, in some instances, the students felt overwhelmed by the amount of information we provided.

To help students to become more independent and motivated, great changes on redesigning courses at ITESM began. With the aid of internet sources, the required reading material became shorter and the syllabus was regularly updated. We did not need to include all the original literature, since the students were required to present brief reviews for each class on the required readings, and they began to access the information by themselves throughout the course. With the internet sources, it was possible to establish agreements with important international organizations that thoroughly review different topics on SD. Up-to-date articles were incorporated into the list of required reading materials. These materials are updated every year.

Because of the production facilities available at the Virtual University, we had the opportunity to establish a video library. Initially, specific subjects were previously recorded at different localities or industries, to illustrate the topics addressed during class. Over the years, we developed a library of interviews with personalities that were specifically invited to our course, or visitors at ITESM such as Nobel Laureates Mario Molina and Norman Bourlaug, as well as Paul Ehrlich, Don Huisingsh and Silvia del Amo; important governmental personalities and entrepreneurs from Monterrey, different regions of Mexico, and from the Business Council for Sustainable Development were also interviewed and videotaped. This library represents an important collection of materials, which reflects the point of view of both scientists and business people in regard to SD and how it influences our daily lives. This material is available to all the students in the course.
9. Team teaching

At the satellite course, the constant presence of two professors has been one important characteristic of this course. Due to the large number of students (~350 students/course), administrators and professors decided to ensure that there were at least two professors active at all times to attend to the students’ needs. The team teaching helped to keep the course very dynamic, enriched student opinions and, quite often, provoked debate that helped students think and participate more actively in the course. The creation of such debates was often reflected in the number of opinions (internet, fax, and telephone calls) received during the broadcast of the lectures.

10. Agents of change

Our main concern has been that the students participate actively and behave in a sustainable manner and not only think or talk of sustainability in the classroom. Since 1995, we have incorporated a new requirement: a final project, which carries most of the weight in the final course grade. This project is ‘hands on’ research by the students, as a team. The students must identify a real problem within their communities or workplaces and present a proposal of how to solve it by using a SD approach. This proposal must show a solution that is well supported socially, environmentally and economically. This represents the opportunity for the students to come up with a solution to a problem that they or citizens of their community criticize. The final project has to be presented to the authorities or personnel that have the power (hierarchically and budgetary) to implement their proposal.

Because of the nature of the problems that the students work on, collaboration of the different expertise of the team members is required. This is one of the most important objectives in this course. They must cooperate and respect each other’s ideas.

The final projects have had an important impact at several levels:

- Several teams changed waste management practices and reduced the use of raw materials in different types of industries by using the ‘3 R’s’ principles (reduce, reuse, recycle). They evaluated the social, economical and environmental impacts of the implementation of their proposals.
- Other teams have introduced some original innovative practices that have had a positive impact at their work places, ranging from paper recycling and waste reduction, to paperless office. For example, a bank changed one of the processes that involved three people and three steps from a rotational serial process with phone and fax resources, where every one changed its activity periodically, but had little contact with the client and was not responsible if something went wrong. Our students proposed to change the process into a parallel one with on-line resources, so that every employee was responsible for the whole process for a given client. The employee got the recognition for good work, the client a better and faster service and the institution raised their productivity by 30%.
- Some teams have worked with NGOs to incorporate social groups into sustainable practices in their communities. For example, they worked with rural communities around their

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Fig. 1. Number of students enrolled during the period January 1998 through January 2004 (ITESM, 2004).
cities such as production of biogas at a pork farm, or the production of compost with food wastes for house vegetable gardens, or helping local villages with getting the right connections and apply for support to introduce water pumps and drinking water into the communities.

- Other teams have played an important role at becoming the link between the waste of some industries and the raw material of others.

One of the most interesting results is that the students became aware of the impacts that they can have at their workplaces at the social, economic and environmental levels. During the development of the final project, the students are having a positive impact at their workplaces. Owners, and high-level and low-level decision makers at small and big enterprises have been influenced by the efforts of these students.

Regardless of the place where the students worked, the people involved got the orientation and support of a group of students on how to solve a real problem from the technical standpoint to the operational level where the students were challenged to make clear the social, technical and economic advantages. The students challenged real problems and were empowered as they became aware that they were becoming involved, and realized that they had the means or learned how to get the right connections to solve the problems. Perhaps this has been the most relevant contribution from this course.

Some of the ideas that the students worked on were not thought up by the team itself. Some ideas came from the people that had the problem, but did not know how to solve it, or did not have the time to justify or implement a potential solution. For example, one group proposed to the INFONAVIT (National Institute for Popular House Construction), a government agency responsible for the construction of popular housing, to modify some details on the layout of the wastewater pipes of houses, increasing the suction force of toilet water by increasing by a few degrees the inclination of the wastewater pipe. This proposal was originally from the parent of one of the students and was embraced by the team of students that made the technical, social and economic analyses for this ‘small’ modification. The students focused their analyses on the amount of water to be saved in a town that faces an important water shortage and municipal water distribution takes place only a few hours a day. The report was sent to the Institute headquarters in Mexico City for revision and approval.

The students started by developing the main ideas for the project with a serious diagnostic study (environmental, social and economic). Then they implemented the possible solution in a scenario where they compared their new visions against the original diagnostic. We required the students to give credit to other persons in and outside of the team that had some input, and therefore, reinforce the idea of teamwork and proper acknowledgement of diverse inputs. Also, during the development of this project, we required a letter from the person responsible for the area, department or community with the problem to be studied. The students have to obtain their permission and also their opinion for the final report. Here is where we measured the impact that the students had within their communities.

11. Compulsory to elective course

During the fall of 1998 this course became an optional course rather than a compulsory one. The students could choose between a course on use of computational technologies or this course on SD. In spite of our initial concern that we would lose a large number of our student population, the enrollment did not suffer too much after this reclassification. The population only dropped slightly the first semester (Fig. 1). Subsequently it has remained constant during the following years. This is an important indicator that our students are interested in learning more about SD.

12. The student’s voice

For the year 2003, this course was singled out by the students as ‘the best course of the year’ of the graduate program at the Engineering and Technology Division of the Virtual University [10]. The authors of this paper recognize that the course is the product and effort from a group the professors and collaborators. We have had their input from the beginning and during the evolution of this course. The evaluations from the students at the end of each course have remained above the average valuation at the Virtual University.

13. Evolution of the course

The incorporation of a SD philosophy at different teaching levels is now the standard for many universities. At ITESM this effort has evolved and diversified as well. It is now taught at different levels and platforms (traditional in classroom, virtual, and on-line), and the different campuses have incorporated it within their careers curricula. It has also been adapted and specialized by different schools at ITESM such as the School of Economics (EGADE) and the Architecture Department, and has been adopted at some other 34 campuses within the ITESM System.

This diversification arose from this original effort of the course ‘Leadership for Sustainable Development.’ Not only at ITESM, but internationally, the SD topic has been adopted and adapted to the different, specific areas, e.g. SD and Economics [11,12], SD and Religion [13], SD and Law [14], among others.

14. SD, a concept for all courses at ITESM

Additionally, the Sustainable Campus program at Monterrey, has invited us to teach a SD course for ITESM professors, so every new course, or the courses that are redesigned, incorporate the concept of the sustainable development within their syllabus. This course has been taught for the last three years.

15. Final remarks

The quality and success of this course are due to the support we have had from the Program Directors of Programa de Graduados en Ingeniería y Tecnologías (PGIT), and the input
of faculty. They have provided all the facilities and technical support for preparing and broadcasting this course. They have made a special effort to support us by maintaining the staff rotation at minimum, as teacher assistants (currently M.Sc. Antonio Alanís Peña), and the production staff. This support has made it possible for the teaching team to consolidate, and guarantee the continuity of the SD tradition at the Virtual University.

During the last ten years, the SD course has evolved in many ways. As a response to the internal teaching tendency at ITESM we have explored several teaching techniques, methods and platforms, from a traditional to a distant teaching and, finally to an on-line course.

The fact that a faculty with a great diversity of backgrounds has been involved in this course has proved to be a great asset. Even though no one was a SD specialist at the beginning of the course, the interests, research lines and commitment of the faculty resulted in a group of professors being able to discuss the different aspects of SD. In the process they developed a profound knowledge of the basic topics of SD.

The wealth of information available has played an important role during the evolution of the course. The amount of information and its quality have grown enormously during the last ten years, from a few books and websites to more than a thousand books and web sites and specialized journals in SD.

This course has also been influenced by the changes in our society. We had begun to incorporate the concept of sustainability into our daily routines. Nowadays, individuals, companies, industries and governments apply the concept of SD, even at international trade agreements. Our graduates must respond to these changes and therefore, the course has evolved to fulfill these demands.

The most important change of all has been the contents and the impact of the course among students. Initially, it was mostly an informative course in which we tried to educate students about the most important environmental issues and social and economic consequences. Younger generations of students are more informed about the environment and the human impact on our planet; therefore, the next logical step has been to evolve to a mixture of an informative and formative course with a holistic approach. Nowadays, the students leave this course as ‘agents of change’ knowing how their everyday actions and choices have an impact on the environment, our society and the well-being of future generations.

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