Implementing Sustainability in the Classroom at Université Laval

Vincent Richard, Daniel Forget and Noémie Gonzalez-Bautista

Abstract

Université Laval has embraced a global approach to sustainability education. Although sustainability has been addressed in the classroom by individuals in the past, it is now being articulated with a vision. In May 2009, the *Study Council* voted to add a new article to the university's *Academic Regulations* stating that all undergraduate students must be introduced to the concept of sustainability. This decision was followed by the creation, in 2012, of a multi-cycle, interfaculty committee on sustainability education. In order to obtain and maintain sustainability certifications, Université Laval must submit lists of courses and programs related to sustainable development. This obligation presented an opportunity to develop a unique and global approach in collaboration with professors and heads of programs. Based on Wiek and collaborators' report entitled "*Key competencies in sustainability: a reference framework for academic program development*" (2011), a mandated work group produced a survey on courses and programs. This survey was created to gain a better understanding of the scope of sustainability education at Université Laval and how sustainability competencies can be developed in any field of studies. This case study is an illustration of concrete and transparent measures that could be implemented in order to make account of SD training on offer.

V. Richard (✉) · D. Forget · N. Gonzalez-Bautista
Université Laval, Québec, QC G1V 0A6, Canada
e-mail: Vincent.Richard@fse.ulaval.ca

D. Forget
e-mail: Daniel.forget@dgpc.ulaval.ca

N. Gonzalez-Bautista
e-mail: noemie.gonzalez.1@ulaval.ca

1   Introduction

As a sizable institution of higher learning, Université Laval first began to offer courses in sustainable development (SD) through the various initiatives of professors concerned with keeping their courses up-to-date and with the social and professional developments taking place in their fields of study. SD thus emerged in university education in the same way that it emerged, several decades ago, as a concern in contemporary society. The diversity of approaches, perspectives, and educational objectives specific to the various disciplines or professions, associated with the different undergraduate programs at Université Laval, made the task of identifying courses and programs in SD particularly difficult and complex. Not surprisingly, the actors attempting to do so also recognized the magnitude of this task.

This article presents the original and solid theoretical approach implemented by the *Comité-conseil sur l'offre de formation en développement durable* (CCOFDD, advisory committee on sustainability education) at Université Laval between Fall 2012 and late Spring 2014. Based on a case study, we will show that the procedures put in place allowed the committee to fulfill its mandate, and, especially, provided a framework of reference enabling all the actors involved in this process to adopt a common language for the purpose of identifying courses and programs in SD on offer at Université Laval.

1.1   SD at Université Laval

As expressed by the senior administration, SD is a priority for Université Laval. The many sustainability initiatives found on campus, impacting the living environment and promoting healthy lifestyle habits, bear witness to the university's desire to improve the quality of life for the university community. While encouraging individuals to adopt values in line with SD, the university is also anxious to ensure that its own choices are consistent with sustainability principles. As stated by the Rector and Vice Rector, "Sustainable development is at the very heart of Université Laval's *raison d'être*, that is, to acquire and transfer knowledge. The quality of its commitment regarding sustainable development has earned an international recognition, with the prestigious distinction of a STARS (Sustainability Tracking Assessment and Rating System) Gold rating awarded by the Association for the Advancement of Sustainability in Higher Education in 2014. Of some 300 participating institutions, Université Laval ranked first among universities in

Canada and ninth among those in the world" (Université Laval 2015, trans.). Not surprisingly then, a considerable effort has been made to identify SD courses and programs on offer at Université Laval.

2 Drawing up a List of Courses in SD

2.1 The Mandate and Task of the Advisory Committee

In 2012, Bernard Garnier, Vice Rector, Academic and International Activities, and Éric Bauce, Executive Vice Rector, Development, set up an advisory committee on sustainability education (the CCOFDD) with the mandate to promote academic programs in SD at the undergraduate, Master's and doctorate levels. The CCOFDD was also given the mandate to develop the criteria used to determine which courses and programs would qualify as courses and programs in SD. To this end, the CCOFDD set up an ad hoc committee tasked, among other things, with establishing the criteria to be used to identify courses and programs in SD and a procedure for labelling the courses that meet these criteria.[1]

2.2 A List of Courses in SD

Drawing up a representative list of courses in SD raises several challenges in itself. Indeed, the committee quickly realized that the curricular focus of the different disciplines corresponding to the vast majority of undergraduate programs often involves very specific objectives, but also, and especially, a very particular view of the issues and challenges relating to SD. Given these multiple definitions of and perspectives on SD, the committee soon realized that a knowledge-based approach was untenable since it would be impossible to come up with an exhaustive summary of the knowledge acquired in such a vastly diverse set of courses.

The CCOFDD's ad hoc committee thus conducted a literature review to explore the various types of courses and programs on offer in the area of SD. This led them to Wiek et al.'s (2011) systematic literature review identifying common and recurring elements associated with sustainability-related courses and programs in higher education. This systematic literature review suggested that most approaches to sustainability education focus on the capacity to solve problems in complex situations (historical context, multiple actors, various perspectives, etc.) and a concern for the future repercussions of decisions.

As pointed out by Wiek et al., "Frameworks or unifying themes for key competencies in sustainability are not frequently used or discussed in the literature. 'Laundry lists' without transparent selection criteria dominate the discourse. It

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[1]The committee also worked to establish the criteria for evaluating programs, but this work is not presented here.

seems that the field is still in search of over-arching concepts that would relate and integrate sustainability competencies in a meaningful way. The few frameworks proposed, applied, or discussed are inspired by transformative learning concepts and propose [some specific] key competencies" (Wiek et al. 2011, p. 205). This finding was in line with the view of the ad hoc committee. Wiek et al. suggest that, in a very general way, five key competencies in SD form a sort of common structure underlying the various approaches identified. This review convinced the committee that a competency-based approach would be best suited to the process of establishing the criteria to be used to identify courses and programs in SD. A competency-based approach offers many advantages. Essentially, it is student-centered, focusing on the resources that students need to integrate and mobilize in order to carry out tasks or actions in any new situation (Maingain et al. 2002). In general terms, competencies in SD can thus be summed up as the mobilization of a combination of knowledge, skills, and attitudes that make successful task performance possible and enable problem solving with respect to real-world sustainability problems, challenges, and opportunities (c.f. Barth et al. 2007; Dale and Newman 2005; Rowe 2007).

2.3 Theoretical Approach

One of the structuring elements of Wiek et al.'s work (2011) is the integrated framework they propose, linking the various stages involved in solving complex sustainability problems. Conceptualizing their approach to sustainability education in terms of complex problem solving, Wiek et al. (2011) thus situated the various competencies that a sustainability-related program should enable students to develop. They thus proposed five key competencies encompassing the main educational objectives related to SD. According to the ad hoc committee, these competencies can be presented as follows:

- **Systems-thinking competence**: The ability to analyze real, complex problems in a comprehensive manner and in context (requires an interdisciplinary approach);
- **Anticipatory competence**: The ability to evaluate the potential consequences of human intervention or non-intervention;
- **Normative competence**: The ability to explicitly include the normative factors that help guide decision-making (values, rules, consequences, goals, etc.);
- **Strategic competence**: The ability to come up with inclusive and applicable solutions to complex problems;
- **Interpersonal competence**: The ability to create opportunities for dialogue, debate and discussion (with a view to collaborative problem solving).

Based on their review of the literature on key sustainability competencies, Wiek et al. concluded that these five competencies must be built in conjunction with the "basic" professional competencies needed for any problem solving. They also

recognized that "interpersonal" competence stands apart from the other four key competencies in SD. Indeed, all five competencies clearly contribute to the problem-solving process. However, it can also be said that the first four competencies refer to immediate problem-solving processes whereas interpersonal competence refers more to the ability to create an environment in which collaborative problem solving is possible. It is not a question here of prioritizing these competencies, but rather of gaining a better understanding of the very possibility of recognizing their development in the context of a university education.

This theoretical approach, based on an extensive literature review, was adopted by the CCOFDD to guide the task of identifying courses and programs in SD at Université Laval. In the CCOFDD's view, this approach allows for the development of a common language, a sort of standard to be used to identify the various ways of integrating SD into an academic program. It also ensures a degree of transparency in the process of identifying and labelling these courses and programs.

2.4 Operationalizing the Process of Drawing up a List of Courses in SD

The theoretical approach adopted by the ad hoc committee allowed the CCOFDD to begin the process of identifying courses in SD on offer at Université Laval. To operationalize this process, the committee decided to make explicit several premises underlying the choices it had made.

One of the principles guiding the ad hoc committee's work was its view that the professor in charge of a course is best qualified to analyze the latter and determine whether or not it constitutes a course in SD. This principle recognizes the expertise of the professors concerned, but puts them in the delicate position of having to evaluate, in a way, the content of their courses. For the committee, this principle implied the need to develop a tool that professors could use to examine their courses. Thus, given the mandate to draw up a list of courses addressing SD at Université Laval, considering the above principle, and recognizing that courses can evolve over time as the university faculty renews itself, the CCOFDD decided to develop a questionnaire to guide professors through the process of analyzing the course outlines of their courses and deciding whether or not the latter contribute to sustainability education at Université Laval. Moreover, given that the course outline explicitly sets out the course content and, in turn, determines students' expectations regarding the course, the CCOFDD considered that the course outline provides the best indication of a course's educational objectives.

The CCOFDD is aware that this way of proceeding opens the door to possible problems regarding a course's qualification as an SD course. However, disregarding the following two premises—namely, (1) that the professor is in the best position to analyze the content of his/her own course, and (2) that the course outline best

indicates the educational objectives of a course—would also open the door to problems that could make the analysis irrelevant or inadequate.[2]

3 Survey of SD Courses

3.1 Methodology

In terms of method, this research adopts a case study approach. The questionnaire was sent, June 2014, to all professors at Université Laval (n > 1500). Data thus collected would give a first portrait of the scope of sustainability education of offer at Université Laval.

3.2 Developing the Questionnaire

The ad hoc committee thus produced a questionnaire that would enable the professors in charge of courses to analyze the course outlines of their various courses and determine whether the latter contributed in one way or another to the development of the key competencies in SD. In line with Wiek et al. (2011), the CCOFDD concluded that it would be relevant to exclude from this questionnaire any items related to the development of "interpersonal competence." The reasons behind this decision were relatively straightforward: it is usually considered that the development of interpersonal competence will be taken care of at the program level[3] rather than at the level of individual courses. Moreover, since the vast majority of undergraduate courses are geared towards the educational objectives of specific disciplines, anything related to the development of interpersonal competence, as understood by Wiek et al. (2011), appears a priori to be covered by the disciplinary curricula. Furthermore, article 104 of Université Laval's Academic Regulations[4] specifies the need, in any undergraduate program, to develop cross-cutting competencies that correspond, in part, to the various components of Wiek et al.'s (2011) interpersonal competence.

Before answering the questionnaire items, the professor can access several documents explaining different aspects of the approach. Thus, in addition to providing spaces to identify the course in question and the professor in charge, the first part of the questionnaire includes three hyperlinks to information on the three

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[2]Before presenting the approach used, it can be said that a high number (approximately 45 %) of the analyses conducted by the professors in charge of courses led them, based on their answers to the questionnaire, to conclude that their courses did not qualify as SD courses.

[3]This competence will thus be found in the analysis of programs currently underway.

[4]Online (in French only): https://www2.ulaval.ca/fileadmin/Secretaire_general/Reglements/reglement-des-etudes-03062014.pdf.

IDENTIFICATION

Duration of the questionnaire: 15 minutes

This questionnaire aims to determine whether the course in question is consistent with a particular approach to sustainability education. The conception of sustainable development (SD) retained here is based on the vision of SD that Université Laval ascribes to, as well as on the 16 principles set out in Quebec's Sustainable Development Act.

1. Course identification code or name.

2. Institutional email address of the professor in charge of this course.

For additional information, please click on the hyperlinks contained in the questionnaire. You can also download a brochure summarizing all this information by clicking here.

Please note that it will not be possible to save the questionnaire as you go along.

To help you fill out this questionnaire, we suggest that you to refer to your course outline. Don't forget to click on "Send" when the questionnaire has been completed.

Fig. 1 Part 1 of the questionnaire: identification

conceptual underpinnings[5]: Wiek et al.'s (2011) approach to sustainability education, the vision of SD that Université Laval ascribes to, and the 16 principles set out in Quebec's SD Act (Fig. 1).[6]

The CCOFDD set out to produce a user-friendly questionnaire that would not take long to complete (15 min) so as to encourage as many professors as possible to fill it out. The CCOFDD thus decided to ask a very limited number of questions and to keep the questions short. The questionnaire items are rated on a Likert scale, indicating the extent to which the respondent agrees or disagrees with the statement expressed in each question. The use of this scale simplifies the processing of the professor's assessment.

3.3 The Questionnaire Items

The main body of the questionnaire is divided into four parts, each presenting one key competency. Each key competency is assessed through a limited number of items, covering its various facets. Several hyperlinks are provided along the way, leading to documents explaining some of the terms used. The number of items used to assess each key competency corresponds to the number of components of the competency as set out in Wiek et al. (2011). It in no way conveys a prioritization among the competencies.

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[5]Note: it is also possible for the professor to download a brochure that presents the questionnaire in detail and includes all the information found in the various hyperlinks provided.

[6]Online: http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=2&file=/D_8_1_1/D8_1_1_A.html.

3.3.1 Systems-Thinking Competence

The first key competency assessed in the questionnaire is referred to as systems-thinking competence (Fig. 2). The professor is asked whether one of the aims of the course is to develop the capacity to analyze complex problems in a comprehensive manner, in context, across different disciplines and different scales. Developing this competence leads students to consider the interactions between the structures and systems in society, including values, cultures, conceptions, preferences, needs, institutions and actors. A course that develops systems-thinking competence promotes:

- A deepening of knowledge related to a specific discipline;
- The exploration and mastery of various models, paradigms and points of view;
- Openness to change and difference;
- Recognition of the contribution made by other disciplines when it comes to identifying the issues (interdisciplinary approach);
- A long-term outlook.

3.3.2 Anticipatory Competence

This key competency corresponds to the capacity to evaluate the consequences of human intervention or non-intervention in future scenarios, based on various qualitative or quantitative data (Fig. 3). By developing this competence, students are enabled to address and reflect on various challenges related to SD based on different scenarios involving intervention or non-intervention by humans within a specific timeframe, that is, (a) on a past-present-future continuum, and (b) over the short, medium or long-term.

Developing this competence also entails mastering tools that can be used to project into the future, such as statistical models, simulated scenarios, etc. A course that contributes to the development of anticipatory competence thus focuses on:

- Developing multi-dimensional, creative and innovative ideas or solutions;
- Assessing the relevance of ideas or solutions;
- Considering the principle of prevention and the precautionary principle;
- Prioritizing solutions that respect intergenerational equity;
- Envisioning desirable scenarios for a sustainable future.

3.3.3 Normative Competence

The third key competency assessed by the questionnaire relates to the normative aspects of complex problems (Fig. 4). This competency is demonstrated by the capacity to explicitly include the various normative factors that help guide decision-making in the analyses and discussion. This includes legal and ethical aspects, such as values, rules, consequences, laws, etc. In short, the development of

SYSTEMS-THINKING COMPETENCE
To what extent does this course aim to enable students to:
3. Analyze the structures, dynamics or issues underlying the challenges of SD?
- o Entirely
- o To a large extent
- o A little
- o Not at all
4. Problematize complex situations related to the challenges of SD?
- o Entirely
- o To a large extent
- o A little
- o Not at all
5. Analyze the interactions between various perspectives (points of view, scales or disciplines) regarding the challenges of SD?
- o Entirely
- o To a large extent
- o A little
- o Not at all

Fig. 2 Items used to assess "systems-thinking competence"

ANTICIPATORY COMPETENCE
To what extent does this course aim to enable students to:
6. Analyze the possible consequences of human action and consider the concept of responsibility, within an SD perspective?
- o Entirely
- o To a large extent
- o A little
- o Not at all
7. Consider the principle of prevention and the precautionary principle within an SD perspective?
- o Entirely
- o To a large extent
- o A little
- o Not at all
8. Consider the concept of intergenerational equity within an SD perspective?
- o Entirely
- o To a large extent
- o A little
- o Not at all
9. Devise and analyze various scenarios within an SD perspective?
- o Entirely
- o To a large extent
- o A little
- o Not at all

Fig. 3 Items used to assess "anticipatory competence"

this competence enables students to identify and adapt proposed solutions to problems in accordance with the values, rules and other norms inherent in the systems in place, mobilizing the concepts of justice, equity and systems integrity to solve problems within a perspective of SD.

A course that contributes to the development of normative competence promotes:

NORMATIVE COMPETENCE
To what extent does this course aim to enable students to:
10. Analyze the legal or ethical aspects of the challenges of SD?
    o   Entirely
    o   To a large extent
    o   A little
    o   Not at all
11. Address the diverse values or principles underlying the challenges of SD?
    o   Entirely
    o   To a large extent
    o   A little
    o   Not at all

Fig. 4 Items used to assess "normative competence"

- A human-centred focus with an emphasis on human rights and social obligations;
- Analysis that takes into account the principles of social and environmental justice and intergenerational equity;
- A focus on bringing out the values at stake;
- The notion of personal and collective responsibility.

3.3.4 Strategic Competence

The last key competency assessed by the questionnaire is strategic competence (Fig. 5). This competence is related to the methodological aspects of any problem solving process from an SD point of view. It refers to the ability to propose inclusive and applicable solutions to complex problems, an essential skill for effective problem solving. It involves using various types of analysis (e.g. qualitative, quantitative or contextual analysis) and the capacity to compare and critically assess different points of view on a subject in order to come up with solutions that are viable in different disciplines, with a view to collective problem-solving in complex situations. Moreover, the capacity to implement an intervention strategy in response to a complex problem is contingent on the ability to organize and mobilize resources such as knowledge, techniques, and analytical and assessment tools, as well as different stakeholders. Ultimately, it is a question of helping students develop the capacity to propose innovative solutions, think outside the box and overcome constraints so as to reframe solutions more effectively.

A course that develops this competence focuses on building:

- Project management skills;
- The facility to develop innovative solutions, open up new avenues and implement new ways of doing things;

STRATEGIC COMPETENCE
To what extent does this course aim to enable students to:
12. Develop the capacity to solve complex problems underlying the challenges of SD?
- o   Entirely
- o   To a large extent
- o   A little
- o   Not at all
13. Develop the capacity to analyze administrative, political and governance-related constraints in order to guide interventions within an SD perspective?
- o   Entirely
- o   To a large extent
- o   A little
- o   Not at all
14. Develop and implement policies, action plans, programs or management systems within an SD perspective?
- o   Entirely
- o   To a large extent
- o   A little
- o   Not at all

Fig. 5 Items used to assess "Strategic competence"

- The ability to identify the main levers, key actors, and significant partners that will support the process of organizational transformation;
- The capacity to put in place policies and action plans to support and guide various methods of problem-solving);
- The ability to identify performance indicators for measuring change (accountability).

3.3.5   Overall Analysis of the Course by the Professor in Charge

The last section of the questionnaire provides ample space for comments (Fig. 6). It allows the professors to bring out some elements of the course that may not have been covered by the questionnaire and which, in their opinion, contribute to sustainability education. This section also allows respondents to express their opinions on both the content of the questionnaire and the entire process itself. It represents a way for the ad hoc committee to obtain feedback on this process.

Lastly, the professor is asked to say how the course contributes to sustainability education (Fig. 7). Four choices are provided: either the course does not address

CONCLUSION

15. Does this course address any elements pertaining to sustainable development that are not set out explicitly in the course outline? If so, in what way?

Does this course address any other aspects of sustainable development? If so, which one(s)?

Do you have any other comments?

Fig. 6 Conclusion of the questionnaire

16. Considering all your answers to the questionnaire, would you say that this course is:
    o   An awareness-raising course in SD
    o   An introductory course in SD
    o   An in-depth course in SD
    o   None of the above

    Cancel   Send

**Fig. 7** The course's contribution to sustainability education at Université Laval

SD, or it represents an awareness-raising course, an introductory course or an in-depth course in SD. Considering the latter three levels of SD integration makes the process of identifying the diverse courses in SD on offer at Université Laval more inclusive and explicit.

Hence, this questionnaire was developed by the CCOFDD as a tool to document, based on a solid theoretical approach, the courses in SD on offer at Université Laval, in accordance with the committee's mandate.

3.4 Preliminary Results of the First Version of the Questionnaire

Once the questionnaire was developed, the CCOFDD's ad hoc committee put in place procedures to enable professors to fill out the questionnaire for any course they were in charge of. To this end, a hyperlink leading to the questionnaire was sent to all professors in charge of courses at Université Laval. The questionnaire was distributed in three waves, between 2013 and 2015 (reaching approximately 1500 professors). As of September 1, 2015, 607 courses had been analyzed by these professors. Of these 607 courses, approximately 336 were duly identified by this process as constituting courses in SD. The data collected enabled the CCOFDD to make several observations regarding the course offering in SD at Université Laval. In particular, the CCOFDD noted that the distribution between the different types of courses in SD (awareness-raising, introductory, in-depth courses) was fairly well balanced, which, in the CCOFDD's view, validates the relevance of this classification system. More specifically, 145 awareness-raising courses, 73 introductory courses and 118 in-depth courses in SD were identified. The CCOFDD also noted a relatively equal distribution between undergraduate level courses and Master's level courses. Thus, approximately 65 % of the courses in SD identified were at the undergraduate level while approximately 35 % were at the Master's level. Moreover, courses in SD were identified in over 50 disciplines or fields of study. For the purpose of clarity, all of these courses are labelled as "SD" courses in the various educational programs.

An analysis of the questionnaire also brought out the extent to which each key SD competency was addressed by the courses analyzed. A quick look at Fig. 8 shows that "systems-thinking competence" and "anticipatory competence" were
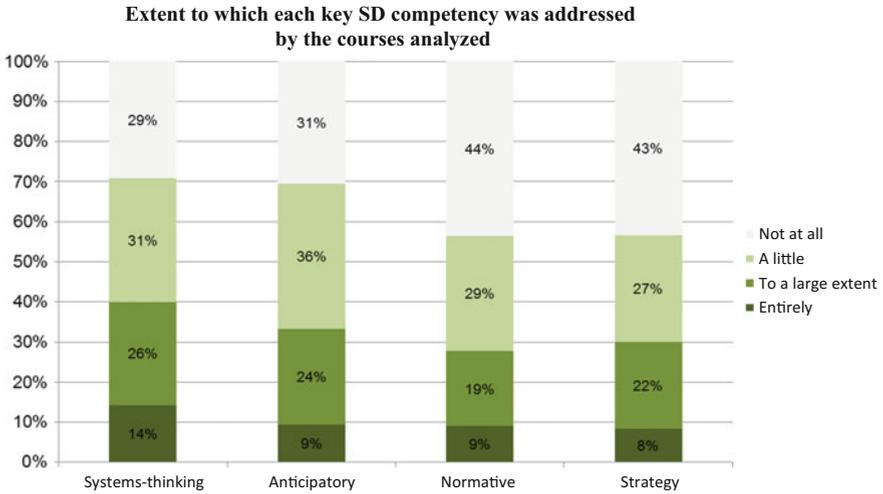
Fig. 8 Extent to which each key SD competency was addressed

deemed to be addressed to a slightly greater extent than "normative competence" and "strategic competence."

Furthermore, over 200 comments were collected, many of which expressed a desire, on the part of the professors, to rework their course outlines, or even the courses themselves, in order to more explicitly include educational components related to the key SD competencies. In the CCOFDD's view, these comments testify to the extent of the professors' commitment, but also the educational nature of the process itself.

3.5 Challenges and Difficulties

The CCOFDD found this process to be highly successful. However, there remains room for improvement. First, one of the limitations of the closed question approach is the difficulty of considering project-based courses, internships, integrative courses, etc., the nature of which can depend on the choices made by students or even, for example, the educational objectives of a professional program. Also, the ad hoc committee is still considering the relevance of re-introducing interpersonal competence in order to be more consistent with the theoretical framework on which this process is based. Moreover, it should be noted that this process is largely based on the professor's subjective evaluation. Lastly, no mechanism for validating the questionnaire had yet been devised.

4 Conclusion

In September 2015, following three years of work, a list of courses in SD on offer at Université Laval began to emerge. The process put in place was intended to be consistent with the vision of SD ascribed to by Université Laval, that is, an operational and transparent process that was as objective and professional as possible. Despite, or perhaps because of, its great simplicity, the questionnaire developed by the ad hoc committee proved to be a very operational tool. Moreover, the numerous and very constructive comments made by the professors showed the extent to which this tool encouraged the latter to introduce key SD competencies in the classroom.

Work remains to be done and numerous challenges lie ahead. The questionnaire needs to evolve. There is a room to innovate further and to document the educational initiatives that are continually being developed on campus. Now that the process of identifying courses in SD is well underway, the CCOFDD is turning its focus to the identification of programs in SD. This second phase of the process will be based directly on the findings that emerged from the first phase. More than merely producing a list of courses in sustainability, we believe that the committee's approach has led to a better understanding of the scope of sustainability education on offer at Université Laval and helped facilitate its implementation in the classroom.

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Authors Biography

Professor Vincent Richard is graduated in Philosophy (2002), holds a master degree in Applied Ethics (2004) and a Ph.D. in Science Education (2012). He is currently Assistant Professor at Université Laval, Québec (Canada), working in the Teacher Education Program—Primary

education. His research interests include the study of the relationships between sciences and society and its integration into the formal curriculum in science education.

Daniel Forget worked for 4 years in characterization and rehabilitation of contaminated sites as a graduate in geological engineering of the École Polytechnique de Montréal. He holds a graduate degree in eco consulting (Université du Québec à Chicoutimi) and was employed as an eco-advisor at Cégep de Victoriaville for more than 3 years. Mr. Forget is now an operations coordinator for undergraduate study direction at Université Laval, where he works to integrate concepts of sustainable development at the heart of university undergraduate programs.

Noémie Gonzalez Bautista is graduated in biology (2004). She holds a Master's degree in environmental science (2005) and a Master's degree in environmental anthropology (2011) from the Museum national d'Histoire naturelle of Paris. Currently PhD candidate at Université Laval, Québec (Canada), she navigates on an interdisciplinary path that would bring her up to work in sustainable development. She is a student member of the Interuniversity Center for Aboriginal Studies and Research (CIÉRA) and of the Hydro-Québec Institute for the Environment, Development and Society (Université Laval). Her current research focuses on social interactions between indigenous and non-indigenous people in environmental management context.