

TITLE OF PROJECT: Flipping Without Flopping: Combining Learning Approaches to Best Benefit Students

PROJECT PARTICIPANTS

Principal applicant

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PART I – PROJECT FINDINGS

Description of the project

In SFU’s Sustainable Development Program (Faculty of Environment), we primarily use four pedagogical approaches in alignment with UNESCO’s recommendations for enquiry-based learning, engagement, collaboration, and communication:

- Lecture (expert-driven learning),
- Flipped classroom (student-led discussions and classes),
- Problem-based learning (one-time activities, in groups, pairs or individually), and
- Project-based learning (semester-long project, in groups or individually).

In this project, we tested the four approaches in order to **better understand the best combination to achieve the course objectives and to help students develop sustainability leadership skills**, as identified in the literature:

1. Systems-thinking (“the ability to collectively analyze complex systems across different domains [society, environment, economy, etc.] and across different scales [local to global]”),
2. Anticipatory skills (“the ability to collectively analyze, evaluate, and craft rich ‘pictures’ of the future related to sustainability issues”),

3. Normative skills (“the ability to collectively map, specify, apply, reconcile, and negotiate sustainability values, principles, goals, and targets”),
4. Strategic thinking (“the ability to collectively design and implement interventions, transitions, and transformative governance strategies toward sustainability”), and
5. Interpersonal skills (“the ability to motivate, enable, and facilitate collaborative and participatory sustainability research and problem solving”)

(Wiek, A., Withycombe, L., & Redman, C. L. (2011). Key competencies in sustainability: a reference framework for academic program development. *Sustainability science*, 6(2), 203-218).

The participants were all students from two courses: SD/REM 483 “Leadership in Sustainable Community Development” (spring 2018 – 8 students) and SD/REM 281 “Sustainable Communities, Sustainable World” (fall 2018 – 19 students). Both are undergraduate courses that welcome students from various disciplines and different backgrounds, to tackle theory and practice of sustainable communities. Initially, the project included comparison with the online SD/REM483 but it had low enrolment in the fall 2018 and was not offered. To overcome this setback, we substituted the online SD 483 for the in-person offering of SD/REM 281 which, despite being a lower-level course, it requires students to be familiar with sustainability theory and put it into practice through real-world projects. In both courses, we used two main research tools: a scenario analysis at the beginning and the end of the semester and an observation form which the RA completed by observing students in one class of each course

Analysis and summary of research results

➤ Observations:

During the discussions and activities in both courses, most students referred to particular aspects of three (out of five) competencies: systems thinking, anticipatory, and strategic. Some concepts within these competencies, such as social systems and values, strategies and actions, justice and responsibility, and feasibility and effectiveness, repeatedly came up within the context of semester-long projects and flipped classroom activities, but not so much during lecture Q&As which related almost exclusively to systemic thinking concepts and language. One interpretation could be that students develop systems-thinking skills mostly during instructor-driven learning (lecture), but they develop the other skills, those that require more critical, value-focused, and forward thinking, when they are more actively participating in the course (during the other three pedagogical approaches). It is worth noting though that interpersonal skills were not as noticeable by the observer and this could be due to the type of pedagogical approaches that were observed for this project; perhaps the learning of interpersonal skills is better supported during problem-based classes and activities, rather than lectures, flipped classroom or semester projects.

There were however wide discrepancies between the two courses regarding the number of confident understanding mentions of concepts. Students in SD483 were more confident in using and had higher understanding of strategic competence concepts than students in SD281: SD483 students mentioned strategic skills 47 times (27 with high confidence), whereas SD281 students mentioned strategic skills only 6 times (2 with confidence). Overall, we noticed that most SD483 students spanned all five competencies with relatively higher confidence than other students and, as a class, they demonstrated higher level of understanding in all competencies than the SD281 students. Of course, this can be explained by the difference in knowledge level and it was a strong indication that students of the leadership course were more prepared to apply the concepts and solve complex community sustainability issues.

➤ Scenario analysis:

The scenario analysis was a useful tool to gauge student understanding of concepts and tools that relate to the five competencies. The scenario was a proxy for problem-based learning: we delivered it at the beginning and the end of the semester in both courses as a short case study that students had to analyse and respond to by evoking sustainability-related knowledge and using critical thinking skills. Our goal was to understand student learning with regard to the five competencies and compare student progress between the start and the end of each course.

We received 15 scenario responses from SD483 students (8 in January and 7 in April) and 23 scenario responses from SD281 students (19 in September and 4 in December). Our conclusions from all scenario analyses we collected are somewhat consistent with the observations in that the responses mostly related to three competencies: systems thinking, strategic, and interpersonal. The development of the first two, systems thinking and strategic competencies, may benefit more from student-led pedagogical approaches (flipped classroom and project/problem-based learning) than lecture or other instructor-led approaches. Despite the lower number of responses in class #13 of both courses, notions of systems and strategic thinking still appeared more frequently than other competencies.

Also, it seems that students may feel freer and more flexible to discuss sustainability solutions that require interpersonal skills when they respond in writing rather than in class discussions. As for anticipatory and normative competencies, a pattern in our data from the scenario responses showed that either problem-based activities are not necessarily the best approach for the two skills or that more work is required from the instructor to create case studies and activities that help students more in developing these skills.

Last but not least, we noticed that handing out the scenarios during the last class didn't yield very useful research results, as we received a lower number of responses, mostly much shorter responses than those in class #1, and some were even partly off topic. One possible reason is that, while we were asking students to do the case analysis voluntarily, they were overwhelmed with final-week coursework (presentations, final papers, etc.); also, many students were absent in the last class.

➤ Feedback from the instructors and students:

As an additional research tool, we asked SD483 students (leadership course) and their instructor to provide us with some feedback in random weeks of the semester, in the form of two-minute summaries. Most students used language that demonstrated that they value interpersonal and strategic skills highly; they talked about the importance of dialogue, collaboration, and storytelling, as well as the significance of learning various skills that can collectively contribute to becoming a leader in the field of sustainable development. Their instructor was mostly on the same page; he also emphasized collaboration and interpersonal skills and noted that student-led approaches seemed to work best for all competencies as long as there is guidance from the instructor.

The SD281 instructor noticed that the students in this course had some general level understanding of sustainability concepts, but only a few had mastery of all five competency areas – and these were because they were older students with related work experience. Nonetheless, most of the students improved their competencies in systems-thinking, anticipatory skills and strategic thinking over the semester. In informal conversations, they identified the problem-based learning and project-based learning as the best way to engage in the learning directly and expand their knowledge of sustainability practice through discussion and interaction with each other and the instructor.

Normative skills and interpersonal skills did not seem to change dramatically over the semester, possibly because these are elements that are more intrinsic to a person's identity and learned behaviours, whereas the other 3 competencies are more intellectual, knowledge-based competencies that are more readily fostered in the classroom setting. It was clear to the instructor that all of the pedagogical approaches are useful, and that the combination of approaches is more effective than using any of them exclusively.

Conclusions and recommendations

Based on our data, we completed a colour-coded matrix that summarizes our findings on the best pedagogical approach for increased learning of each of the five sustainability competencies. We need however to keep in mind that the data we collected was 100% qualitative and the interpretation contained some degree of subjectivity.

Pedagogical approach	SD Competencies				
	Systems-thinking	Anticipatory skills	Normative skills	Strategic thinking	Interpersonal skills
Lecture	Excellent fit	Very good fit	Excellent fit	Good fit	Neutral
Flipped classroom	Very good fit	Excellent fit	Excellent fit	Very good fit	Good fit
Problem-based learning	Excellent fit	Very good fit	Very good fit	Good fit	Very good fit
Project-based learning	Excellent fit	Excellent fit	Very good fit	Excellent fit	Excellent fit

Overall, given that we compared two in-person courses, instead of an in-person and in online one, we have concluded that teaching and learning in interdisciplinary fields such as sustainable development is best served through a combination of all pedagogical approaches. Emphasis should be given though to student-led, problem/project-based approaches since they seem to increase learning in all five competencies for sustainability leadership.

PART II – CHANGES AND IMPLICATIONS

1. Changes to the project plan.

According to the final grant proposal (December 2017), we would compare data from two offerings of the same course, SD483: the in-person class from Spring 2018 and the online class from Fall 2018. Unfortunately, the online course was not offered in the fall 2018, due to low enrolment, and, in consultation with the ISTLD, we decided to compare the results from SD483 Spring 2018 with those from SD281 Fall 2018. The two courses are foundational courses of the same program, despite the differences in level and focus.

2. Additional funding.

We did not receive any additional funding.

3. Changes in my/our teaching.

This project provided us, the instructors in the Sustainable Development Program, with valuable insights that we plan to incorporate into our teaching from now on. In the future, we plan to emphasize student-led teaching more when it comes to helping students develop sustainability leadership skills.

4. Learning from the unexpected.

As explained above in question 1, we had to collect data from a different course than planned, during the second part of data collection (SD281 instead of SD483, fall 2018). Although this change was frustrating to deal with at first, we collected more data than we had expected to collect from the online SD483 (which usually has a small number of students). However, the data is not completely comparable as the two courses are different in level and focus. One of the key takeaways from this experience is that the research plan of such a T&L project needs to be flexible to accommodate for the unexpected while providing direction for the research. Another learning was that in the future we should deliver any surveys or other research tools in any class between class #1 and class #12 (not the very last one), for better research data.

5. Influence of the project on the teaching of others.

Given that the project has only recently wrapped up, we haven't noticed any influence of our findings on teaching practice of our colleagues yet.

6. Other influences, links, outcomes or “spin-offs”.

The RA briefly discussed the project with other participants of the Certificate Program in University Teaching and Learning that she completed in the spring 2018, and some expressed interest in finding out more when the project results are finalized.

PART III – SHARING AND DISSEMINATION

1. Sharing findings with my/our colleagues.

Similarly to our previous T&L projects, we plan to keep discussing our findings and thoughts within the Sustainable Development Program, the School of Resource and Environmental Management, and the Faculty of Environment during research group meetings and other occasions. Given the opportunity, we will of course discuss our experience with colleagues in other SFU departments and programs, through workshops, conferences and other events (for instance, once this report is uploaded on the TLDG website, the RA will share the link with former participants of the Certificate Program in University Teaching and Learning).

2. Publications and conference presentations already done.

We do not have any publication or conference presentation plans for the near future.

3. Future dissemination plans.

We do not have any further plans, apart from what was mentioned above.

PART IV – KEYWORDS FOR PROJECT AND STUDENTS INVOLVED

1. Keyword description of project.

Sustainability teaching, sustainability skills, sustainability leadership, sustainability competencies, pedagogical approaches

2. Students involved.

Course number & course title	Semester (Spring 2016, Summer 2020, etc.)	Approximate number of students
SD483	Spring 2018	8
SD281	Fall 2018	19