CSAP 4.0: Two Reports to Improve Academic Sustainability Plans
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Abstract
In order to inform the development of Penn’s Climate and Sustainability Action Plan 4.0 (CSAP 4.0), we completed two reports, under the guidance of the Environmental Innovations Initiative, that evaluated Penn’s sustainability curriculum and integration of academics into prior CSAP’s respectively.

Introduction
In consultation with the Environmental Innovations Initiative, the student Eco-Reps working under the Office of Sustainability conducted vital research and concept formulation for the University of Pennsylvania Climate and Sustainability Action Plan (CSAP) 4.0. A previous iteration, CSAP 3.0, details the university’s intention to reach 100% carbon neutrality by 2024. In particular, this Eco-Reps project investigates best practices in academic curriculum programming, applied research, and effective integration of academic goals into sustainability plans. Under the supervision of Environmental Innovations Initiative Senior Director, Melissa Brown Goodall, and Associate Director for Outreach, Kelley Widerman, two reports using existing data on Penn’s sustainability curriculum and achievements were carried out. Briefly, the Course Gap Analysis evaluated data on sustainable courses at Penn to identify opportunities for course expansion and the Academic Integration report researched peer institution’s academic sustainability plans in order to inform Penn’s future academic sustainability plans.

Project Overview
The Penn Environmental Innovations Initiative is a newly created program within the Office of the Provost that supports faculty among interdisciplinary departments to encourage inventive solutions to environmental problems as well as develops educational programs to communicate and implement these solutions. This academic year, the Environmental Innovations Initiative proposed the following three goals to support better sustainability learning outcomes among Penn undergraduate and graduate students:

1) Set the stage for better integration of Academic goals into CSAP 4.0.
2) Define key elements of a possible Experiential Learning program at Penn.
3) Support student academic journeys.

More specifically, a series of reports were proposed in order to deliver on these goals: a Course Gap Analysis, Student Opportunities Analysis, Peer Effort Landscape Analysis, Integration of Academic Goals into Sustainability Plan Analysis, and a Sustainability Network Review. Due to time constraints and unforeseen circumstances, we decided to focus solely on the Integration of Academic Goals and Course Gap Analysis reports. Briefly summarized, the goal of the Integration of Academic Goals report was to research how Penn could better integrate
academic plans into their sustainability plan (CSAP 4.0). Likewise, the Course Gap Analysis report’s goal was to identify specific areas in Penn’s curriculum where sustainability courses could be offered using data on current sustainability-related courses. In practice, these reports can be viewed as varying in their scope while still being complementary, with the Integration report serving as a broader level analysis of Penn’s sustainable academic goals and the Course Gap report serving as a more specific data-driven look into the implementation of these goals within the curriculum.

The Integration of Academic Goals into Sustainability Plan Analysis leveraged data presented in the Association for the Advancement of Sustainability in Higher Education (AASHE) Sustainability Tracking and Assessment and Rating System (STARS), a program that evaluates the sustainability plans and progress of over 500 Higher Education institutions. This data was used to analyze how Penn can strengthen its Academic Goals within the CSAP 4.0 report. In addition to Penn’s STARS data, data from universities that both resemble Penn’s status and structure and achieved high STAR ratings in the Academic and Learning Outcomes categories were chosen as guiding examples.

The Course Gap Analysis report used data on current sustainable course offerings in order to identify gaps in Penn’s current course offerings in terms of topic, sustainability focus, difficulty, and school. More specifically, this data included all courses (as of 2020) that substantially implemented sustainability within their curriculum, sorted by the general topic(s) or “track(s)” within sustainability that the course falls under, as well as information on the academic level, school of offering, prerequisites, and department. These tracks were: Climate, Nature, Resiliency, Environment and Health, and Environment and Equity; with many courses falling under multiple tracks. Using this data, vital conclusions on weaknesses within Penn’s sustainability curriculum were drawn, ultimately supporting Goal 1 and 3 proposed by the EII by informing the future development of courses and advocating for the offering of more accessible and diverse sustainability courses.

Research Findings

Course Gap Analysis Report

Analysis of the track, department, difficulty, and requirements fulfilled of current sustainability-related classes reveals three main areas of improvement. First, sustainability courses are concentrated within a few “tracks.” Of the 295 sustainability courses, 150 fall within the Resilience track, 105 in the Nature track, 54 in Equity, 50 in Climate, 30 in Health, and 25 in Urbanization. This speaks to the dominance of the Resilience and Nature classes in terms of overlapping tracks, i.e. many classes are listed as falling within the Resilience and/or Nature track as well as another track. It also shows how certain topics, such as Health and Urbanization, are underrepresented. While classes in Resilience and Nature cover a variety of important topics, such as ecology, biology, chemistry, engineering, infrastructure, etc., there is clearly an opportunity to diversify and expand course offerings. Splitting these courses up by degree-
program, one can see that there is a roughly similar distribution of undergraduate and graduate courses by track. Of note, there are few graduate Urbanization and Health classes and more graduate Equity courses. Beyond this unequal distribution of courses by topic, there is unequal distribution of classes by level and requirements fulfilled. For example, there are only 2 Health classes and 5 Equity and Urbanization classes that fulfill a requirement. Further, for the Health topic, the only classes that fulfill requirements are advanced or intermediate and for the Urbanization topic, 4 out of the 5 are advanced or intermediate, beyond the reach of most Penn students not in the relevant specific major. Given that fulfilling sector and topic requirements are some of the few incentives students have to take classes outside their field of focus, this issue is especially pressing. Lastly, there is a clear mismatch between departments with large (undergrad) enrollments and departments with sustainability courses. For example, Economics, Finance, Political Science, and Psychology have 1 sustainability course, while Management and Marketing, as well as many engineering departments have zero. Yet, these departments are some of the most popular at Penn. In fact, outside of Environmental Studies, Geology, Sociology, Urbanization, and a few design departments, the departments that do offer a sustainability related class for the most part only offer one or two. Intertwined with this issue is the distribution of sustainability courses across schools, with the College of Arts and Sciences containing the vast majority of sustainability courses, followed by the Weitzman School of Design. Wharton, GSE Nursing, and the Law School all only contain a handful of sustainability courses, despite their caliber of education. For a school like Penn that is known for preparing the top business leaders, lawyers, and doctors of tomorrow, the lack of sustainability courses in these schools is particularly concerning.

Supporting Visuals
Academic Integration Report

Following a review of peer university STARS reports and sustainability plans, this report will consider and target a list of best practices for integrating academic goals into university sustainability plans. Only about 7% of the University of Pennsylvania’s student body is graduating from programs that require a basic understanding of sustainability. This statistic, in part, is fueled by the below average rating the University of Pennsylvania receives for sustainable learning outcomes within the STARS report (look Table 1). In addition, the data presented in Table 1 suggests that the increase of academic sustainable course offerings by department as well as the pursual of a sustainability literacy assessment would contribute significantly to improving the University of Pennsylvania’s overall Curriculum score. In comparison to other universities with similar academic missions, such as Stanford, Cornell, and Northwestern, the University of Pennsylvania fails to meet AASHE STARS Stars Program requirements by an average of around 31.35%. It is imperative that more than 7% of Penn’s students graduate with previously mentioned requirements. In light of this data, in order to identify the best practices that the University of Pennsylvania could imminently implement, the sustainability plans from the following universities will be considered with greater specificity.

To best select institutions in which the University of Pennsylvania can replicate, universities which exceed on the scores Curriculum and Learning Outcomes by 35% compared to the University of Pennsylvania will ensure that the institutions’ sustainability plans are role models in which best practices can be adapted. The universities who meet this criterion and therefore will be taken into consideration are;

- Stanford University
- Cornell University
- University of California, Berkeley
- Emory University

With the selection of best institutions to read and analyze their sustainability plans, the best practices each university adapts, but Penn does not, are as follow.

Stanford University
- Incorporation of community-engaged learning courses that establish connections between students and local organizations in need of sustainable solutions to present problems faced in the respective communities.
- Development of an Environmental Justice Working Group in charge of developing curriculum such as a gateway Introduction to Environmental Justice course as well as an Environmental Justice minor
- Commitment to developing an entire school focused on climate and sustainability.

Cornell University
• University wide requirement to graduate with a sustainability learning outcome as part of the core curriculum, regardless of area of study or major
• Cultivate student climate literacy by implementing a "To-Do List Module" for all incoming students

UC Berkeley
• Explore interdisciplinary partnerships for integration of sustainability into academics such as within freshman writing and composition courses
• Increase transparency of sustainable course offerings and sustainability-related majors and minors available

Emory University
• Host the AASHE national faculty development program, supporting more than 250 faculty from across the country to integrate sustainability into their curriculum
• Conduct a survey of sustainability related course offerings and research opportunities on a regular cycle (every three years)
## Supporting Visual and Sources

<table>
<thead>
<tr>
<th>Institution</th>
<th>Curriculum</th>
<th>Academic Courses (out of 14.00)</th>
<th>Learning Outcomes (out of 8.00)</th>
<th>Immersive Experience</th>
<th>Sustainability Literacy Assessment</th>
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<td>University of Pennsylvania</td>
<td>22.1/40.0</td>
<td>5.8</td>
<td>2.3</td>
<td>2.0/2.0</td>
<td>Not Pursuing (n/a)</td>
</tr>
<tr>
<td>Columbia</td>
<td>23.0/40.0</td>
<td>3.5</td>
<td>3.5</td>
<td>2.0/2.0</td>
<td>2.0/4.0</td>
</tr>
<tr>
<td>Cornell</td>
<td>37.8/40.0</td>
<td>12.4</td>
<td>7.4</td>
<td>2.0/2.0</td>
<td>4.0/4.0</td>
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<tr>
<td>MIT</td>
<td>25.3/40.0</td>
<td>10.2</td>
<td>1.1</td>
<td>2.0/2.0</td>
<td>0.0/4.0</td>
</tr>
<tr>
<td>Northwestern</td>
<td>25.3/40.0</td>
<td>4.3</td>
<td>7.0</td>
<td>2.0/2.0</td>
<td>Not Pursuing (n/a)</td>
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<td>Yale</td>
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<td>4.2</td>
<td>2.0/2.0</td>
<td>2.0/4.0</td>
</tr>
<tr>
<td>Stanford</td>
<td>38.2/40.0</td>
<td>12.2</td>
<td>8.0</td>
<td>2.0/2.0</td>
<td>4.0/4.0</td>
</tr>
<tr>
<td>University of California, Berkeley</td>
<td>36.3/40.0</td>
<td>14.0</td>
<td>6.4</td>
<td>2.0/2.0</td>
<td>4.0/4.0</td>
</tr>
<tr>
<td>Emory University</td>
<td>34.7/40.0</td>
<td>8.7</td>
<td>8.0</td>
<td>2.0/2.0</td>
<td>4.0/4.0</td>
</tr>
<tr>
<td><strong>Average (Excluding UPenn)</strong></td>
<td><strong>32.0/40</strong></td>
<td><strong>8.9</strong></td>
<td><strong>5.7</strong></td>
<td><strong>2.0/2.0</strong></td>
<td><strong>3.3/4.0</strong></td>
</tr>
</tbody>
</table>

Table 1: Integration of sustainability within academics among peer universities to the University of Pennsylvania.

Initial Observations:
Penn is 31.35% behind the average overall curriculum score for two reasons:

--> Penn fails to pursue/ fulfill a score in the "Sustainability Literacy Assessment" criteria.
--> Penn falls behind in its ratings for "academic courses" and "learning outcomes".

Results and Evaluation

**Results**

The research contained in these reports holds valuable information on how Penn can improve sustainable learning outcomes. While each report focuses on different parts of this goal, with the Course Gap analysis focusing on specific courses and their curricula, and the Academic Integration Report focusing on higher level academic plans, together they constitute invaluable information on the integration of sustainability and academics as a whole.

Specifically, the Course Gap analysis shows that, while Penn offers many sustainability-focused classes, they are unequally distributed across School, Department, level, and topic. This is an issue as it means that students in some schools or departments, particularly those with a more pre-professional focus, are less able to achieve important learning outcomes. This not only compromises their education, but also their preparation for the workforce, as sustainability will increase in its importance in the next few years. In terms of specific recommendations, I propose that a targeted inquiry is done on how schools with a relative lack of sustainability courses, such as Wharton, Penn Law, Penn Nursing, and the Graduate School of Education, are planning to bolster their sustainability offerings. Likewise, departments with large enrollments seem to be underrepresented, necessitating an inquiry into how sustainability can be introduced into these popular fields via new courses or updated curricula. It is also clear that there is a lack of introductory courses, and specifically intro courses that fulfill requirements, in the Health, Equity, and Urbanization tracks. I propose that administrators work with faculty and students in relevant departments on how courses covering these topics can be introduced. While these are only a small segment of actions that can be taken, I hope the data collected in the Course Gap Report is used to motivate action.

After looking into the best practices each institution exhibited and comparing them to the academic goals of the University of Pennsylvania’s CSAP 3.0 academic goals project, the following three recommendations and modifications to avoid are summarized in the table below.

<table>
<thead>
<tr>
<th>Replicate</th>
<th>Avoid</th>
</tr>
</thead>
<tbody>
<tr>
<td>University-wide requirement to graduate with a sustainability learning outcome as part of the core curriculum</td>
<td>Departmental control over student acquisition of a sustainable learning outcome.</td>
</tr>
<tr>
<td>Conduct a pre-registration survey of sustainability related course offerings.</td>
<td>Every three years. (Suggest every semester or year.)</td>
</tr>
<tr>
<td>Increase transparency of sustainable course offerings through improved advertising and technology.</td>
<td>Ambiguity on technological improvements enacted. (course flagging: course catalogues, etc?)</td>
</tr>
</tbody>
</table>
To provide recommendations that are feasible for the University of Pennsylvania to adapt below are present the three actions, in much more specificity, that Penn can implement.

(1) Enactment of a university-wide requirement to graduate with a sustainability learning outcome as part of the core curriculum (Cornell). Although the University of Pennsylvania has tripled its course inventory, the accessibility and transparency of the courses offered are limited, especially due to its lack of introductory sustainability classes. The University of Pennsylvania can benefit from the replication of Cornell’s requirement of graduating with a sustainable learning outcome, ensuring students are more literate in sustainability and encouraging the creation of more sustainability-focused courses. Unlike Cornell, who leaves it up to individual departments to ensure that students achieve sustainable learning outcomes, Penn should implement a requirement school-wide.

(2) Conduct a pre-registration survey of all sustainability related course offerings every semester. To further establish how sustainable learning outcomes are embedded in the curriculum of the University of Pennsylvania’s Departments we propose the academic head of each department to fill out a general survey filling out the following content:

1. Department Name
2. Head of Department
3. Total number of student degrees awarded (2021-2022 school year).
   a. Undergraduate
   b. Graduate
4. Number of student degrees with sustainable learning outcomes (2021-2022 school year).
   a. Undergraduate
   b. Graduate
5. A 200-to-300-word count commentary on how sustainable learning outcomes are present in their department.

The current lack of integration of sustainable concepts within the academic curriculum, coupled with the rising necessity of climate education, drive the need for such a requirement. Therefore, the opportunity for the Environmental Innovations Initiative to have a more comprehensive understanding of departmental curriculum in relation to sustainability would allow the initiative to better assess existing curriculum gaps and suggest relevant and actionable improvements.

(3) Increase transparency of sustainable course offerings through improved advertising, such as through course flagging on course catalogues, as well as greater promotion of existing sustainability related courses of study such as the minor in environmental humanities (UC Berkeley).

For example, to better guide students when it comes to selecting their desired courses, course tags can be integrated into student course review database (PennCourseReview). PennCourseReview, hosted by PennLabs, is a student-run course catalogue that extracts the
numerical ratings of courses from end-of-semester student evaluations and aggregates the data to provide students with an informed outlook for course selection. As one of the highest visibility avenues for informing the student body about course quality, adding a “sustainability” course tag to indicate students of sustainability-related courses could potentially drive greater student interest to these courses.

However, upon reaching out to PennLabs, the Student Eco Reps team received the following response to this proposition:

“Concerns raised by the team after our proposition was presented were as follow;

1. Penn labs expressed difficulty in such implementation because they would need to “manually update/change the list of tagged courses each semester as course codes change or new courses are created”.

2. Confusion would rise if “we only had one or two types of tags available”; lengthening their timeline until they gather enough information to provide an array of tags.”

In response, we suggest two follow-ups: (1) allow the Student Eco-Reps team to assist in the manual update of the list of sustainability-related courses, and (2) argue that the implementation of this system for a single sustainability course tag would instead demonstrate a remarkable commitment to sustainability and could garner significant positive user feedback.

Evaluation

Establishing a great connection with project partners is essential for setting up a strong groundwork. This is especially important for when the project entails the completion of specific work, in this case two reports, rather than an open-ended project where there is less of a pre-specified structure. At first, given the detailed goals of each report, we struggled to understand the specific research and deliverables our reports entailed. However, this understanding grew towards the end of the first semester as we established more regular meeting times and were able to share essential documents more proactively with our project partners via a Dropbox. From then on, we sustained better communication and were able to make quick progress during the second semester. However, given time constraints and our decision to dive more in-depth into our initial projects, we were unable to complete additional reports set forth at the beginning of the year. In the future, we could have communicated our questions and inquired about the project expectations sooner, but all in all we had a fruitful working relationship with our project partners.

Conclusion

As shown by the thorough nature of our reports, we were able to successfully complete our projects and motivate our recommendations in a rigorous, data-driven way. In this way, we were able to achieve two goals set initially: set the stage for better integration of Academic goals into CSAP 4.0 and support student academic journeys. The research and data analyzed resulted in the formulation of a few key recommendations, among them the creation of a school-wide sustainability course requirement, increased communication about sustainable course offerings,
and further investigation into the lack of sustainable course offerings in Wharton and Penn Engineering and other pre-professional schools. The implementation of these recommendations will significantly improve the sustainability literacy of Penn students and allow Penn to better incorporate sustainability education and practices into the academic side of its operations.

These reports also lend insight into next steps other researchers and/or future eco-reps can take to build on the research findings thus far. For example, it would be fruitful to update the course gap report as courses are added and reformulated each year. In relation to the Academic Integration Report, it would be beneficial to assess whether academic goals are met in the next irritation of the CSAP and new, higher-striving goals are set into place. This will allow the University of Pennsylvania to better account their progress. Also, while attempts at working with Penn Labs to integrate indicators of sustainable content into course descriptions were unsuccessful, we believe this is a vital next step to increase enrollment in sustainable courses.

Overall, through the help and guidance of our project partners, we were able to develop two reports with goals highly relevant to the success of Penn’s next CSAP.

**Appendices**

**Useful Related Resources:**
Penn Sustainable Course Inventory: [https://sustainability.upenn.edu/course-inventory](https://sustainability.upenn.edu/course-inventory)
- Information on every course at Penn that teaches concepts related to sustainability

Association for the Advancement of Sustainability in Higher Education (AASHE) Sustainability Tracking and Assessment and Rating System (STARS), University of Pennsylvania Report: [https://reports.aashe.org/institutions/university-of-pennsylvania-pa/report/2021-08-09/](https://reports.aashe.org/institutions/university-of-pennsylvania-pa/report/2021-08-09/)
- 2021 Report that evaluates Penn’s sustainable practices and plans

**Key Stakeholders:**

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<thead>
<tr>
<th>Project Partner</th>
<th>Position</th>
<th>Contact</th>
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<tbody>
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<td>Maria Ximena Trujillo</td>
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