Creating Future World Class Engineers: An Addition to the Engineering Passport Assignment to Promote Sustainability

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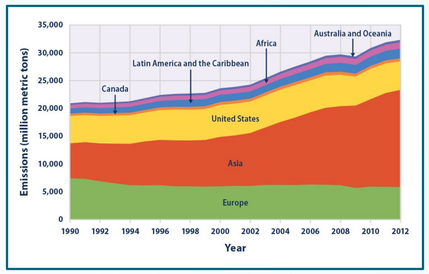
Abstract

As Climate Change begins to cause new problems in our society, engineers will be required to have new skills to design, operate, and deploy sustainable technology. Thus, the future engineers from Penn State will need to be prepared with new skills to continue to uphold the status of "World Class Engineers." To develop a sustainably-focused mindset early, there is an opportunity to implement sustainability based education in the Engineering Passport assignment, which is completed by all engineers at Penn State. This study conducted feasibility proposals to groups in the community that champion sustainability to create "Sustainability Sessions," a 50 minute interactive learning session, to serve as an addition to the Engineering Passport assignment. This study was able to establish 6 different partners from the community to host sessions.

Motivation

As the issues from climate change are becoming more prevalent in society, the future engineers from Penn State need to become aware of how to tackle this problem through realistic and holistic solutions. Through an addition to the Engineering Passport to Success assignment that is sustainably focused, students will have an introduction to how to tackle the problem of climate change. This assignment will:

- Promote a sustainable engineering mindset through the introduction of Drawdown's goals and solutions with in-action learning through partnership with campus clubs and organizations.
- Facilitate exposure to Penn State's campus clubs, organizations, and services to first-year students



Global greenhouse gas emissions (EPA 2015)

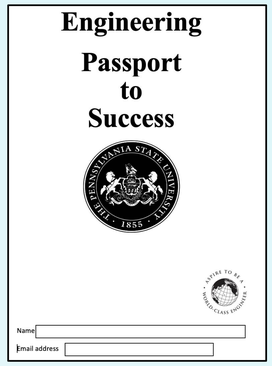
Introduction

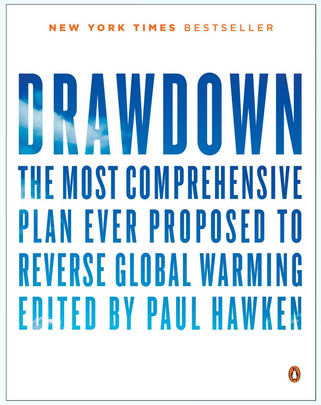
- Advance general idea how the educational sessions would function through partnership
- Developed a list of clubs that are environmentally focused and advertised through Penn State's OrgCentral system
- Explored Penn State's services that promote sustainability and Drawdown technology
- Established communication with a point of contact at these clubs and services
- Began to foster ideas into Sustainable Sessions by working alongside our contacts

Methodology

Revising the Engineering Passport

Every student in the Engineering Department has to take a first-year seminar class during their Freshman year. This class typically teaches a specific topic in the world of engineering whether it being about research or applications of skills in a branch of engineering. One of the universal assignments in all First-Year Seminar classes is the Engineering Passport to Success. This assignment is meant to introduce students to university resources, the academic community, and responsibilities as a student at Penn State. To prep students for current day issues, we must prepare them for one of the biggest challenges of the next few decades, which is Climate Change. Thus, the addition to the Engineering Passport is meant to introduce students to highlighted sustainable technologies provided by *Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming* to begin to foster an engineer that is knowledgeable on how renewable technology is realistically deployed. Thus, an idea was formed to have students learn about these technologies through interaction with community groups that promote their use. We have called these educational sessions a "Sustainability Session."





Partnership with Organizations and Services

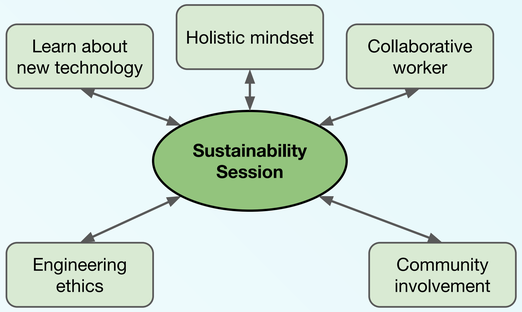
A set of guidelines were created for potential partnerships to host these sustainable sessions. These guidelines include:

- Session lasts 50 minutes
- Showcases sustainable technology/pathway
- Collaborative work encouraged
- Interactive learning preferred
- Accessible to students by being on campus and during week

Through communication with clubs and Penn State services, proposals for Sustainability Sessions that could realistically meet the created guidelines began to form.

Established Learning Objectives

Adding the Sustainability Sessions to the engineering passport will serve as a foundation for future engineers to meet the challenge to reduce carbon emissions, as they become exposed to the fundamental impacts of renewable technology. Through the Sustainable Session, students will also be exposed to communities on campus they might have not been aware of. Bringing new opportunity for these communities to grow and students to expand their college experience.



Results

Proposed Sustainable Sessions

Student Dining Services

- Drawdown Solutions: **Composting**, **industrial recycling**, **plant based diet**, and **reduced food waste**
  - Proposed Sustainable Sessions
    - Community dinner eating local picked food for a plant based meal
    - Green-to-go box impact on CO_2 reduction compared to using styrofoam
    - Methods to deployed cut down food waste (showing weight of food thrown away on screens and better size planning when ordering food)

Student Farm Club

- Drawdown Solution: **Composting, Farm Irrigation Efficiency, Conservation agriculture**
- Proposed Sustainable Sessions
  - Life cycle assessment on the plastic used for the high tunnel
  - Design a wagon that fits the parameters for the farm
  - Learn/research about the different materials used for hydroponics system (right now they use styrofoam and that might have carcinogens and doesn't break down)

Wind Energy Club

- Drawdown solutions: **Wind Energy**
  - Proposed Sustainable Sessions
    - Demonstration of windmill models

Next Steps

- Keep open communication between Sustainability Session partners
- Further refine guidelines and learning materials
- Pilot run the short-list of clubs and services interested
- Reach out to more clubs, services, organizations, and community groups that champion sustainability and showcase Drawdown in action
- Implementation into the Engineering Passport assignment