Experiential student learning & LEED: An Arc case study from SUNY
October 19, 2020
Gautami Palanki

- Q&A: Use the Chat Box for your questions today!
- Email: contact@arcskoru.com
- Twitter: @gautamipalanki and @arcskoru
Continuing Education

- Self Report 1 CE hour, with LEED AP O+M specialty
- Experiential student learning & LEED: An Arc case study from SUNY
  - Course ID: 0920022682
  - Provider: GBCI
- Login into www.usgbc.org
- Account > Credentials > “Report CE hours”
• **Arc is part of the USGBC and GBCI family of organizations.**

• **Arc is a technology platform to measure, analyze, and score the real-world performance of spaces, buildings, and places.**
Leadership

Anyone, anywhere can use Arc.

www.arcskoru.com

Arc for All

Performance Certificates

Provides an incremental path to recognize performance in individual categories.

www.arcskoru.com/arc-performance-certificates

LEED Certification

Arc supports LEED v4.1 O+M and LEED Recertification.

www.arcskoru.com/arc-for-leed
Arc Re-Entry

www.arcskoru.com/re-entry
Resources

Arc
www.arcskoru.com
contact@arcskoru.com

LEED LAB
www.usgbc.org/education/leed-lab
Incorporating Arc into the SUNY Green Building Experiential Learning Collaborative

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Forest and Natural Resources Management
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sunypoly.edu/gbelc
Incorporating Arc into the SUNY Green Building Experiential Learning Collaborative

Funded Project
Green Building LEED Certification by Student Experiential Learning
SUNY Performance Improvement Fund Award
7/1/2018 - 6/30/2021

About the Project
The SUNY Green Building Experiential Learning Collaborative (GBELC) is a partnership between SUNY Polytechnic Institute, SUNY ESF, and SUNY Oneonta supported through the SUNY Performance Improvement Fund for clean energy workforce development. The GBELC is training highly skilled graduates proficient in green building design and with project experience in LEED building certification of campus buildings. It is our hope that the curriculum modules

sunypoly.edu/gbelc
Overview

• Project objectives
• Why it matters, why LEED?
• Course prep, development & delivery
• Incorporating Arc
• Results & feedback
• Lessons Learned
• Student experiences
• Acknowledgements
• Questions
Project Objectives

Make campuses into living laboratories
  • Teach new experiential learning courses in which students certify existing campus green buildings

Develop NYS Workforce
  • Students earn personal industry credentials (LEED GA)
  • Develop capacity of faculty & staff accreditations (LEED AP)

Scale capabilities across SUNY
  • Share expertise and best-practices with other campuses
  • Increase in-house capacity for measuring air quality
Partners: ESF, Poly, Oneonta

SUNY by the numbers
- 64 Campuses
- 424,051 students
- 2,195,000 continuing ed.
- 91,180 staff
- 32,500 faculty
- >3,000 Vehicle fleet
Why it matters

• NYS Reforming the Energy Vision
• SUNY Clean Energy Road Map
• Workforce development
• Experiential learning opportunities
• Building occupant health and well-being
• Environmental impact of buildings
• LEED Lab curriculum
Why LEED?

LEED v4

CERTIFIED: 40-49 points
SILVER: 50-59 points
GOLD: 60-79 points
PLATINUM: 80+ points
<table>
<thead>
<tr>
<th>Goal</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate Change</td>
<td>35%</td>
</tr>
<tr>
<td>Human Health</td>
<td>20%</td>
</tr>
<tr>
<td>Water Resources</td>
<td>15%</td>
</tr>
<tr>
<td>Biodiversity</td>
<td>10%</td>
</tr>
<tr>
<td>Green Economy</td>
<td>10%</td>
</tr>
<tr>
<td>Community</td>
<td>5%</td>
</tr>
<tr>
<td>Natural Resources</td>
<td>5%</td>
</tr>
</tbody>
</table>
Advanced Preparation

• Arrange for access to Campus information
  – Meet with physical plant staff to discuss their collaboration
    • Students will need access to project documents (plans, and specifications if available)
    • Students will need access to energy/water use data (historical and current)

• Arrange for access to USGBC materials
  – Study bundles, exam registration
  – Set up USGBC accounts
  – LEED Online
  – ARC platform
  – LEED v4 Reference Guide
Course Development

- Followed existing USGBC LEED Lab model
- Engaged stakeholders for staff and faculty support
- Different approaches
  - **ESF** – CME 496 experimental course, allowed as option for degree program requirement, co-taught
  - **Poly** – CE/ME 448 & IDS 251 formally approved by campus curriculum committee as electives, co-taught
  - **Oneonta** – courses for online delivery, hired new full-time visiting faculty
Course Delivery
CME 496 Principles of Green Buildings

- Orientation to the course and to the building –
- Delivery - Two times a week, 1 Lecture, 1 quiz/work/presentation session
- Topics covered in lecture did not necessarily align with work done for documentation
- Quizzes simulated LEED GA questions
- Students presented to classmates on progress, challenges
<table>
<thead>
<tr>
<th>Category</th>
<th>Points</th>
<th>Prerequisite/Credit</th>
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</thead>
<tbody>
<tr>
<td><strong>Location and Transportation</strong></td>
<td>14</td>
<td>Prerequisite Transportation Performance</td>
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<tr>
<td><strong>Sustainable Sites</strong></td>
<td>4</td>
<td>Credit Rainwater Management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Credit Heat Island Reduction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Credit Light Pollution Reduction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Credit Site Management</td>
</tr>
<tr>
<td><strong>Water Efficiency</strong></td>
<td>15</td>
<td>Prerequisite Water Performance</td>
</tr>
<tr>
<td><strong>Energy and Atmosphere</strong></td>
<td>35</td>
<td>Prerequisite Energy Efficiency Best Management Practices</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prerequisite Fundamental Refrigerant Management</td>
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<tr>
<td></td>
<td></td>
<td>Prerequisite Energy Performance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Credit Enhanced Refrigerant Management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Credit Grid Harmonization</td>
</tr>
<tr>
<td><strong>Materials and Resources</strong></td>
<td>9</td>
<td>Prerequisite Purchasing Policy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prerequisite Facility Maintenance and Renovations Policy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prerequisite Waste Performance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Credit Purchasing</td>
</tr>
<tr>
<td><strong>Indoor Environmental Quality</strong></td>
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<td>Prerequisite Minimum Indoor Air Quality</td>
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<tr>
<td></td>
<td></td>
<td>Prerequisite Environmental Tobacco Smoke Control</td>
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<td></td>
<td></td>
<td>Prerequisite Green Cleaning Policy</td>
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<td></td>
<td></td>
<td>Prerequisite Indoor Environmental Quality Performance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Credit Green Cleaning</td>
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<tr>
<td></td>
<td></td>
<td>Credit Integrated Pest Management</td>
</tr>
<tr>
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<td>100 Possible Points</td>
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<td>LEED v4.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>LOCATION AND TRANSPORTATION</strong></td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Prerequisite</td>
<td>Transportation Performance</td>
<td></td>
</tr>
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</table>

| **SUSTAINABLE SITES** | 4 |
| Credit | Rainwater Management |
| Credit | Heat Island Reduction |
| Credit | Light Pollution Reduction |
| Credit | Site Management |

| **WATER EFFICIENCY** | 15 |
| Prerequisite | Water Performance |

| **ENERGY AND ATMOSPHERE** | 35 |
| Prerequisite | Energy Efficiency Best Management Practices |
| Prerequisite | Fundamental Refrigerant Management |
| Prerequisite | Energy Performance |
| Credit | Enhanced Refrigerant Management |
| Credit | Grid Harmonization |

| **MATERIALS AND RESOURCES** | 9 |
| Prerequisite | Purchasing Policy |
| Prerequisite | Facility Maintenance and Renovations Policy |
| Prerequisite | Waste Performance |
| Credit | Purchasing |

| **INDOOR ENVIRONMENTAL QUALITY** | 22 |
| Prerequisite | Minimum Indoor Air Quality |
| Prerequisite | Environmental Tobacco Smoke Control |
| Prerequisite | Green Cleaning Policy |
| Prerequisite | Indoor Environmental Quality Performance |
| Credit | Green Cleaning |
| Credit | Integrated Pest Management |

| **INNOVATION** | 1 |
| Credit | Innovation |

**TOTAL** | **100 Possible Points**
Tracking Performance in LEEDv4.1

- **Energy**
  - Energy Consumption
  - Tracking Energy Consumption

- **Water**
  - Water Consumption
  - Tracking Water Consumption

- **Waste**
  - Either Waste Audit or Ongoing Waste Tracking
  - Choosing a Waste Audit or Tracking Waste Production

- **Transportation**
  - Result of Transportation Survey
  - Conduct a Transportation Survey

- **Human Experience**
  - Combination of Air Quality Testing and Survey Results
  - Conduct Air Quality Testing and the Occupant Survey
Current Arc Scores

- Energy: 28/33
- Water: 14/15
- Waste: 8/8
- Transportation: 13/14
- Human Experience: 16/20

100 Seymour Rd SUNY Polytechnic Institute, NY, US
<table>
<thead>
<tr>
<th>START DATE</th>
<th>END DATE</th>
<th>READING (kWh)</th>
<th>COST (USD)</th>
<th>DOCUMENTATION</th>
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<td>17.59</td>
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<td>May 30, 2020</td>
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<tr>
<td>Apr 01, 2020</td>
<td>Apr 30, 2020</td>
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<tr>
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<td>Jan 01, 2020</td>
<td>Jan 31, 2020</td>
<td>37.21</td>
<td>$2256.31</td>
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</tbody>
</table>
Add Energy Data

1. Create a Meter
2. Enter Your Data
3. Upload Documentation

Next Cancel
Scope 1 and 2 emissions
Cumulative GHG emissions from Oct 14, 2019 to Oct 13, 2020

Scope 1  Scope 2

69.12 MTCO2e
Scope 1 and 2 emissions
Cumulative GHG emissions from Oct 14, 2019 to Oct 13, 2020

69.12 MTCO2e

GHG Emissions by source
GHG emissions sources from Oct 14, 2019 to Oct 13, 2020

Source (MTCO2e)
- Fuel
  - 69.09 (99.95%)
- Electricity
  - 0.0301 (0.04%)
- Transportation
  - 0.0062 (8.97e-3%)
<table>
<thead>
<tr>
<th>ID</th>
<th>NAME</th>
<th>ADDRESS</th>
<th>TYPE</th>
<th>CERTIFICATION</th>
<th>SCORE</th>
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<tr>
<td>1000133616</td>
<td>SUNY Poly Cayan Li...</td>
<td>Utica, New York, University</td>
<td>Building</td>
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<td>8000003012</td>
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<td>Utica, New York, University</td>
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<td>8000003009</td>
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<tr>
<td>8000003006</td>
<td>Campus Center</td>
<td>Utica, New York, University</td>
<td>Building</td>
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### Meters & Surveys

<table>
<thead>
<tr>
<th>Building Setting</th>
<th>Value</th>
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<tbody>
<tr>
<td>SUNY Poly Cayan Library</td>
<td>61 / 100</td>
</tr>
<tr>
<td>Energy</td>
<td>19 / 33</td>
</tr>
<tr>
<td>Cayan Library Electric</td>
<td></td>
</tr>
<tr>
<td>Cayan Library Nat Gas</td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>12 / 15</td>
</tr>
<tr>
<td>Cayan Library Water</td>
<td></td>
</tr>
<tr>
<td>Waste</td>
<td>8 / 8</td>
</tr>
</tbody>
</table>

### WASTE

#### Waste Data

<table>
<thead>
<tr>
<th>Data</th>
<th>Details</th>
<th>Documents</th>
</tr>
</thead>
</table>

#### Third Party Resources

Explore apps to help monitor data

**View Apps**

<table>
<thead>
<tr>
<th>START DATE</th>
<th>END DATE</th>
<th>GENERATED DIVERTED</th>
<th>UNITS</th>
<th>SOURCE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep 08, 2020</td>
<td>Sep 14, 2020</td>
<td>23.5</td>
<td>5.5</td>
<td>lbs</td>
<td></td>
</tr>
</tbody>
</table>
SUNY POLYTECHNIC INSTITUTE Informed Consent for Research Survey Fall 2020

Title of Study: Transportation and Occupant Satisfaction Survey for LEED O+M Certification of Cayan Library
Principal Investigators: Mark Bremer & Zhanjie Li

You are being invited to participate in a research study. Please take a few moments to read the explanations which follow to help you decide whether to participate or not.

Description of Study
This research study is being carried out in order to calculate performance scores in several green building certification categories. We are conducting this research in order to discover the commute patterns of building occupants and occupant satisfaction with the indoor environment. We would like to include you in the study because you work in (or visit) Cayan Library and are 18 or older. If you decide to take part, we will ask what mode(s) of transportation you take to get to and from the building. Additionally, we will ask about your level of satisfaction with the building's indoor environment. You can expect to spend about 3 minutes on the survey.

Risks and Discomforts
If you participate in this study, you will experience no more than minimal risks or discomforts. The survey is anonymous. If you choose to optionally give your name, your responses will be kept confidential.
1. On a typical day, how do you get to and from this building? Enter results for "one day, one way".

Route 1
- Select Travel Method

+ Add Another Route

2. Use the slider to indicate how satisfied you are with the environment in this building.

Neither satisfied nor unsatisfied

Extremely Unsatisfied

Extremely Satisfied

sad face
1. On a typical day, how do you get to and from this building?
Enter results for "one day, one way"
Route 1
Select Travel Method

2. Use the slider to indicate how satisfied you are with the environment in this building.

Neither satisfied nor unsatisfied

Extremely Unsatisfied

Include any miles you travel to get to this building.

Travel Method
- Walk
- Bike
- Telecommute
- Bus
- Light rail (trolley, tram, streetcar)
- Rapid transit (subway, metro)
- Motorcycle or scooter
- Car solo
- Carpool 2-3 people
- Car: Alternate fuel

Distance In: Mile

SAVE CANCEL
Survey Responses

% of People Responded

For your project, a response rate of 25.00% will generate a score.

Popularity of Transport Modes

<table>
<thead>
<tr>
<th>Mode</th>
<th>% of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus</td>
<td>80</td>
</tr>
<tr>
<td>Car: solo</td>
<td>80</td>
</tr>
<tr>
<td>Carpool: 2-3 people</td>
<td>0</td>
</tr>
<tr>
<td>Car: alternative fuel</td>
<td>0</td>
</tr>
<tr>
<td>Motorcycle or scooter</td>
<td>0</td>
</tr>
<tr>
<td>Walk</td>
<td>0</td>
</tr>
<tr>
<td>Bike</td>
<td>0</td>
</tr>
<tr>
<td>Telecommute</td>
<td>0</td>
</tr>
<tr>
<td>Subway/Metro</td>
<td>0</td>
</tr>
<tr>
<td>Tram or streetcar</td>
<td>0</td>
</tr>
</tbody>
</table>
1. On a typical day, how do you get to and from this building? Enter results for "one day, one way".

Route 1

Select Travel Method

+ Add Another Route

2. Use the slider to indicate how satisfied you are with the environment in this building.

Neither satisfied nor unsatisfied

Extremely Unsatisfied

Extremely Satisfied

Neither satisfied nor unsatisfied

Extremely Unsatisfied

Extremely Satisfied
2. Use the slider to indicate how satisfied you are with the environment in this building

Satisfied

Extremely Unsatisfied

Extremely Satisfied

3. We're glad to hear that. Please select the options below that significantly enhance your satisfaction:

- [ ] Thermal Comfort
- [ ] Sound
- [ ] Air Quality
- [ ] Cleanliness
- [ ] Light
- [ ] Privacy
- [ ] Views to Outdoors
- [ ] Daylight

Comments (Optional)

Location - e.g. Lobby, 2nd Floor East, 50th Floor - Suite 500

Name (Optional)

Which type of occupant are you?

- [ ] Regular Occupant

Submit
2. Use the slider to indicate how satisfied you are with the environment in this building.

Unsatisfied

Extremely Unsatisfied

3. We’re sorry to hear that. Please select the options below that significantly reduce your satisfaction:

- Dirty
- Smelly
- Stuffy
- Acoustics
- Hot
- Cold
- Dark
- Glare
- Privacy
- Humid
- Drafty
- Bright
- Views to Outdoors
- Sound

Comments (Optional)

Location - eg. Lobby, 2nd Floor East, 50th Floor - Suite 500

Name (Optional)

Which type of occupant are you?
Occupant satisfaction
Average occupant satisfaction from Oct 14, 2019 to Oct 13, 2020

% response rate

Satisfaction details
Oct 14, 2019 - Oct 13, 2020
- responses for the period

Air quality
Cleanliness
Daylight
Light
Privacy
Sound
Thermal comfort
Views to outdoors

Dissatisfaction details
Oct 14, 2019 - Oct 13, 2020
- responses for the period

Bright
Cold
Dark
Dirty
Drafty
Glare
Hot
Humid
Loud
Smelly
Sound
Stuffy
Views to outdoors
Privacy
<table>
<thead>
<tr>
<th>Carbon Dioxide</th>
<th>Total Volatile Organic Compounds</th>
<th>PM2.5</th>
<th>Ozone</th>
<th>Carbon Monoxide</th>
<th>Acetaldehyde</th>
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</table>

Transportation Survey

Human Experience

Occupant Satisfaction Survey

<table>
<thead>
<tr>
<th>START DATE</th>
<th>END DATE</th>
<th>READING (ppm)</th>
<th>SOURCE</th>
<th>DOCUMENTATION</th>
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<tbody>
<tr>
<td>Nov 13, 2019</td>
<td>Nov 13, 2019</td>
<td>520.6</td>
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</table>
Generates better, cheaper mobility data in real time
Results and Student Feedback

- **Key challenges:**
  - Prerequisites
  - Policies
  - Project Management skills

- **Student Performance**
  - 25 out of 35 passed LEED GA
  - 1 out of 2 passed LEED AP (O+M)

- **Feedback:**
  - Course Organization
  - Group work
  - O+M vs. BD+C
Lessons Learned

• Define objectives:
  – Green building knowledge
  – Credential – LEED Green Associate
  – Experiential – Project documentation

• Benefits
  – Memorable student experience and industry recognizable skills
  – Recognition for campus efforts
  – Partnerships to share educational load

• Challenges
  – Organizational structure of institution (e.g. policy implementation)
  – Organizational structure of USGBC
  – Student’s working on projects need guidance in:
    • Communication with teammates and with professionals
    • Project management skills vs. typical linear educational assignments
Angie Persello, LEED Green Associate

Major: Civil Engineering Technology, Old Dominion University

- Hands on LEED experience in Central New York
- Served as CME 496 Project & Communications Coordinator
Lesson Learned:
Data Collection & Analysis

Future Use:
Project Management
Document Organization

<table>
<thead>
<tr>
<th>READING START DATE</th>
<th>READING END DATE</th>
<th>READING (kWh)</th>
<th>COST (USD)</th>
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<tbody>
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<td>Jan 26, 2020</td>
<td>Feb 25, 2020</td>
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<tr>
<td>Dec 28, 2019</td>
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<td>Sep 27, 2019</td>
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<tr>
<td>Aug 28, 2019</td>
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Lessons Learned:
Identifying Trends
Benchmarking

Future Use:
Recognizing Areas for Improvement
**Lesson Learned:**
LEED Terminology

**Future Use:**
LEED Exams
Project Management

<table>
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<th>Add Occupancy</th>
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<tbody>
<tr>
<td><strong>Effective date</strong></td>
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</tr>
<tr>
<td><strong>Regular building occupants (daily average)</strong></td>
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<td></td>
</tr>
<tr>
<td><strong>Days per week with visitors</strong></td>
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<tr>
<td></td>
</tr>
<tr>
<td><strong>Number of visitors each day</strong></td>
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<tr>
<td><strong>Duration of visit (in hours/day)</strong></td>
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M’Kenzie Bradshaw, M+R Group Leader

Major: Mechanical Engineering
Graduation Date: May 2021
Material and Resource Group Leader

Career Interests:
- National Grid
- Mechanical Engineering workforce
- Different fields of Energy

Why I chose this course:
- Further knowledge on green buildings
- Opportunity to certify a Suny Poly building
- Being able to apply skills for future work
- Earn personal industry credentials (LEED GA)
What have I learned?

- In class lectures incorporating Arc
- Experience Using Arc
  - Waste Audit
  - Energy Data
  - Air Quality Measurements
- Preparation of LEED GA Exam
Learning Arc

In class Virtual Tour of Arc:
• Can be used for LEED Certification
• Can determine readiness based off of inputted data
• Where the project was located and the different tools
• How data was inputted
• How arc scores the categories

Utilizing Arc Platform:
• Inputting Data in Meters & Surveys
• Analyzing performance scores of individual categories
• The Arc performance score with a different visual

With this being a virtual semester the Arc platform provided us a place to collaborate as a class and make this project successful!
Preparing for LEED GA Exam

Core Concepts Guide (USGBC)
- Explains green building fundamentals and sustainable systems thinking
- Strategies for 7 main categories

Exam Preparation Guide
- Gain knowledge on key terms and definitions
- Completing practice questions and test
- Becoming familiar with the testing process
- Utilizing Digital: Quick Quizzes, Flash Cards, Practice Exams
How will I apply this to my future?

Importance of tracking building performance:

• Continue expanding green energy development
• Ensure building occupants are healthy & productive
• Reducing negative environmental effects

<table>
<thead>
<tr>
<th>MATERIALS AND RESOURCES</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td></td>
</tr>
<tr>
<td>Purchasing Policy</td>
<td></td>
</tr>
<tr>
<td>Facility Maintenance and Renovations Policy</td>
<td>Required</td>
</tr>
<tr>
<td>Waste Performance</td>
<td>8</td>
</tr>
<tr>
<td>Credit</td>
<td>1</td>
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</table>

Project Management

As the leader of M+R it was my job to:

• ensure prerequisites for category were completed.
• be the contact person for M+R group
• input waste data for waste audit into Arc
Green Building Experiential Learning Collaborative

→ Share & Scale-up

- Lead with pilot projects at partner campuses
- Build course and certification project templates
- Share templates and best-practices with other campuses
- Develop a SUNY inter-campus Sustainable Buildings minor / micro-credential
- Expand use of indoor air quality testing as teaching tools
- Automate building performance monitoring

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Acknowledgements

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• Patrick Whitford, Undergraduate Student

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• Rachel Kornhauser, Sustainability Coordinator
• Tracy Allen, Interim Dean, School of Sciences
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Experiential student learning & LEED: An Arc case study from SUNY
October 19, 2020
Continuing Education

- **Self Report 1 CE hour, with LEED AP O+M specialty**
- **Experiential student learning & LEED: An Arc case study from SUNY**
  - **Course ID:** 0920022682
  - **Provider:** GBCI
- **Login into** [www.usgbc.org](http://www.usgbc.org)
- **Account > Credentials > “Report CE hours”**
Green Building Experiential Learning Collaborative

Course Lessons

• Experimental/special topics course
• Curriculum committee course action (6+ months)
• Coordination with facilities staff and building occupants for measurement activities involving students
• IRB exemption application for survey
• Counting visitors for weighted occupancy calculation
• Cost per student $220 (education materials + LEED GA exam fee)
• Building registration fee $1200
• Building certification fee $0.038/sf
Green Building Experiential Learning Collaborative

Admin Lessons

• Good communication among stakeholders
  – Copy relevant staff on communications
• Shared google doc for related emails, calls, and meeting minutes
• Adequate time for project coordination, course release and compensation
• Meet with staff early in the planning stages to review requirements
• Cost for staff accreditation $600 (education materials + LEED AP exam fee)
• Compensate staff for their time