Heritage Park and Preservation of the President Pump Engine House
Friedensville Mine Site, PA

Gerard (Jerry) Lennon
Professor of Civil & Environmental Engineering
Outline

• A little bit about the Heritage Park Concept (part of student work)
• Student Project Work
• Future Plans

Appendices with additional information (not in talk)
1. Advocates for site

Mark Connar & Mike Kaas enthusiastically diligent:

- Site Research (reviewing/interpreting/)
- Sharing the importance of the site
- Many presentations to many groups.
- Catalyst for action
- Engaging people
- Mark: co-sponsor for student projects
- Mike: subject-matter expert” resource for students
2. Site Management Responsibility

Lehigh’s Finance & Administration Stem that manages site’s current/future use/development

Mark Ironside, Executive Director, Business Services, makes recommendation to upper administration on big decisions. Ran a campus world-café format event in April 2018 format to get campus input on what to do with Stabler gift land.

Erin Kintzer, Director, Real Estate Service, responsibility (including day-to-day) for managing many of the 755 acres of land gift given by Donald Stabler’s company in 2012; reports to Mark Ironside. Lead author on Keystone (Pennsylvania) Historic Preservation Planning Grant.

Sustainability Officer (Delicia Nahman), manages Green Fund, & works with others to fund/lead/support continued work, including student projects.
3. Management Challenges

- Set strategic vision for using 755-acre Stabler gift
  - Historic area is potentially 20-50 acres of the gift
  - Good fit well as part of larger future potential use
  - Surrounded by 2 new hotels, corporate offices, residential, upscale luxury mall, easy access to I-78

- Appreciate/share the site’s historic value
  - Be willing to act & invest resources
  - Know/decide what to do (short/long term)

- Get Buy In: Campus Community, Upper Administration

- Continue to have support from local township officials & residents
4. Historic Preservation Grant

Proposed Planning Project Keystone (PA) ($50K)

Submitted by: Lehigh University (Erin Kintzer)
In coordination with Upper Saucon Twp. (UST)
May hear decision in June

Highlights: …preservation needs…significant of property reprioritization due to…UST & Mark Connar’s dedicated effort…have sparked interest with University faculty & staff… …central focus of Technical Entrepreneurship course sequence…consistent with university mission…

To advance learning through the integration of teaching, research and service to others.

…goals: evaluate feasibility of preserving…potential to convert private land to public recreation site incorporating site’s history
Components (all but last concurrent)

- Phase 1A Cultural Resource Assessment
- Vegetation removal & Wetland Evaluation
- 3D Scan with drone flyover
- Structural Study/Evaluation & stabilization work plan
  - Engine House & adjacent Pump Shaft
- Permanent survey benchmarking

Help determine size & extent of proposed public land
Jerry’s Role: get 5. campus community & deciders to understand/care/Buy In

Jerry Lennon’s Role

• Attended internal Lehigh world café conducted by Mark Ironside’s team, where he shared idea of Heritage Park with ~100 faculty, staff & administrators

• Invited by Mark Ironside to present Site History & Student Involvement at an on-site April 2018 visit by Mark’s stem of university

• Recruiting faculty, & getting Buy In their area of direct expertise & ability/interest to lead student projects

• Proposed & is a sponsor of TE course, wrote internal funding proposal, organizing maps for GIS project
6. Proposed Park Concept

...of Ueberroth Site. May expand to include Hartman, and other
Outline

• A little bit about the Heritage Park Concept (part of student work)

• Student Project Overview of Course Highlights of their work is included in talk

• Future Plans

Appendices with additional information (not in talk)
Our Student Engagement Philosophy for this project

*Engage younger generation in Industrial Archeology*

Lehigh students as learners

- When possible, they *take charge of their own learning* with guidance from us
- **Doing** vs. listening
- **Learning** vs. teaching
- Engage with **Technology**

Consciously set goals by student level of achievement

See Appendix 2: student projects that were actually built using this philosophy include student presentations of multi-million dollar facilities to the board of trustees

Discussed w/ Matt Kierstead to get to know the SIA audience better
Blooms Taxonomy: (Cognitive) Levels of achievement

Creative Commons Attribution license; free to share, reproduce, etc. as long as you attribute it to the Vanderbilt University Center for Teaching.
Technical Entrepreneurship Capstone Design course use a process for customer driven product/process development in a business context.

Highlights in Appendix A.
• **TE 211: Conceptual Design (spring)**
  1. Develop the Business, Social & Technical Context
  2. Develop New & Innovative Concepts
  3. Test & Evaluate Best Concept

• **TE 212: Detailed Design & planning for launch/implementation (fall)**
  1. Detailed description of product/process & business case
  2. Fabricate & build preproduction prototypes
  3. Developing business strategy & plan project launch
Our Mission is to incorporate the historical significance of the President Pump and engine house into a park design for the Ueberroth Mine Historic District

Justin Caspar, Christy Conley, Andrew Dintino, Erin Hank, Stephanie Kong, Owen Loughlin, Robert Tischbein
Rationale For Creating Park

Project increases land value for all parties
- Lehigh: bolsters plans for a corporate park
- Upper Saucon: additional township amenities

Success of similar historical sites in the Lehigh Valley
- National Museum of Industrial History
- Hoover-Mason Trestle
Sample Student Survey Question #3

How much would historical significance increase your desire to visit a park?

Answered: 100   Skipped: 0

<table>
<thead>
<tr>
<th>ANSWER CHOICES</th>
<th>RESPONSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very much</td>
<td>46.00%</td>
</tr>
<tr>
<td>Somewhat</td>
<td>37.00%</td>
</tr>
<tr>
<td>Not at all</td>
<td>17.00%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100</td>
</tr>
</tbody>
</table>
Would you be willing to use a phone app at a park to learn about historical landmarks?

Answered: 100    Skipped: 0

<table>
<thead>
<tr>
<th>ANSWER CHOICES</th>
<th>RESPONSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>80.00%</td>
</tr>
<tr>
<td>No</td>
<td>20.00%</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
</tr>
</tbody>
</table>
## Customer Needs

<table>
<thead>
<tr>
<th></th>
<th>Recreation</th>
<th>Historical Significance</th>
<th>Interactive Historical Exhibit</th>
</tr>
</thead>
<tbody>
<tr>
<td>VR Model</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Historical Walking Trail</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Day in the life of a miner signs</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
</tbody>
</table>
## CUSTOMER METRICS

<table>
<thead>
<tr>
<th>Need</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recreation</td>
<td>Length of walking trail</td>
</tr>
<tr>
<td></td>
<td>Friendliness to pets</td>
</tr>
<tr>
<td></td>
<td>Square footage of open space</td>
</tr>
<tr>
<td>Historical Significance</td>
<td>Accessibility to old Ueberroth site buildings</td>
</tr>
<tr>
<td></td>
<td>Preservation done on old buildings</td>
</tr>
<tr>
<td></td>
<td>Amount of convenient historical sites</td>
</tr>
<tr>
<td>Interactive Historical Exhibit</td>
<td>Amount of signage on walking trail</td>
</tr>
<tr>
<td></td>
<td>Ease of use of virtual model</td>
</tr>
<tr>
<td></td>
<td>Display of virtual model</td>
</tr>
</tbody>
</table>
SIGNAGE PROTOTYPE

Comprehensive
Prototype includes all written and visual information desired

3. Trotter Vein Entrance

At this entrance, the miners went underground for the rest of the day to work. Miners worked all day when the sun was out, until it was dark as it would be at nighttime.

Mining is very dangerous work for they needed to be able to see what they were doing, while still having two hands free to work. Miners would wear cloth or canvas hats that had a metal piece in the front to attach a lamp, shown below.

After 1850, these lamps were typically oil-wick cap lamps or carbide lamps with a lit fuse. Although the light was needed, having an open flame in the mine and on the miners forehead did pose a serious safety risk and required all the miners to be very careful while they were working.
Prototype: 3D Model
Why use a Computer Model?

- Individualized experience
- Interactive differentiates from other sites
- Recreational
One source for creating animated model of pump engine
How “The President” Operated

Bob Rod

Piston-Cylinder

6’ ScalePerson

Flywheel
OUR MODEL IN ACTION:
TE_AnimatedPresidentPump.mov

https://www.dropbox.com/s/su6zoaatda9r1em/TE_AnimatedPresidentPump.mov?dl=0
Completion of CAD model
  ▫ Refine motion study, exploded view, VR/AR
Finalize historical signage for trail
  ▫ Locations, design, QR code integration
Overview of plan for future park development
  ▫ Trail path, park amenities
Concurrent Plan: Considering Many Opportunities, Many Cautions.

- Create *Augmented Reality* Environment
  - Include 3D Scan of Engine House
- GIS Mapping with GIS-locator equipped drone
  - Incorporate existing maps into GIS
  - Accurately locate facilities at Ueberroth & Hartman mines
- Opportunity! Water Quality & Soil sampling
  - Student Field sampling, expert guidance from faculty & professionals in practice
  - Caution!: Environmental Concerns
- Opportunity! Industrial Archeology Plan
  - Start with cultural resource assessment if planning grant is approved
  - Set up strict field investigation protocol
  - Caution!: Careful if/when disturbing the site
One environmental concern is smelting operation

We know dates of operation of smelter at Ueberroth Mine:\footnote{1}

Many references in Lehigh Special Collections,

- Operated intermittently in that 3-year period.
- We also know estimated tonnage volumes in USGS table:\footnote{1}
  - Less than 1,000 short tons

Compare to 8.2 million short tons at NJ Zinc’s Palmerton ( < 0.01%)

Smelter & Roaster at Ueberroth site erected over an engine house

- Survey work should be able to determine if the extent to which the building was reused.

Located on map, plan locate for GIS maps with Lehigh’s Earth & Environmental Science Department’s GIS-equipped drone.

\footnote{1}{https://pubs.usgs.gov/of/2010/1131/ especially pp 95-96}

Mr. S. S. Palmer, President
The New Jersey Zinc Company,
71 Broadway, N.Y.

Dear Mr. Palmer:

Pursuant to your request I visited the Friedensville Mines for the purpose of offering some plan for the operation of these Mines. I attach to this report a sketch which I have made which may help to convey the ideas which I will hereinafter give.

Jas. B. Tonking

Map: 7-BD-65a N.Y.
Section View, Ueberroth & Friedensville Mines, From drawing #7-BD-65,
Questions?

Mike

QR Codes: pdfs of our talks

Jerry

Email jerry.Lennon@Lehigh.edu for QR Codes of PowerPoint Slides. They are Large Files! Slow Download!
Appendix A: TE Program Overview

Quick overview of the Design for a “single” product like the Heritage Park

For more information on the Technical Entrepreneurship Capstone Design Two-Course sequence, see https://te.lehigh.edu/ (Neel & Patterson)
What is Engineering Design? Definition from ABET (engineering accrediting agency)

“The process of devising a system, component, or process to meet desired needs, specifications, codes, & standards within constraints such as health & safety, ethics, policy, sustainability, cost, constructability, and manufacturability…”
Entrepreneurial Mindset & Engineering Skillset

Entrepreneurial Mindset
- Awaken Creative Curiosity
- Create Personal, Business, and Social Value
- Pursue Collaborative Connections

Engineering Skillset
- Make
  - Teamwork
  - Leadership
  - Communications
  - Global awareness
  - Life-long learning
  - Professionalism
  - Sustainability
- Model
  - Teamwork
  - Leadership
  - Communications
  - Global awareness
  - Life-long learning
  - Professionalism
  - Sustainability

(Prof. John Ochs’ KEEN Innovative Learning Project)
What’s the point in doing something if no one wants it?
TE Capstone 1 (TE 211) Course
Conceptual Design Topics

**WHAT**
- Identify Customer Needs
- Establish Target Specifications
- Generate Product Concepts
- Select Product Concept(s)
- Test Product Concept(s)
- Set Final Specifications
- Plan Downstream Development

**HOW**

- Mission Statement
- Benchmark Competitive Products & Business Models
- Build & Test Mockups, Prototypes & Business Models
- Create & Manage Intellectual Property (IP)
- Research & Apply Appropriate Industry, Business & Engineering Standards
- Design & Develop Customers & Business Model
- Customer Segments
- Value Proposition
- Distribution & Sales Channels
- Customer Relationships
- Key Activities
- Key Resources
- Key Partnerships
- Revenue Streams
- Cost Structures

- Business Model
- Product Specifications
TE Capstone: A series of What's then How's

**Planning, usually before Courses start**

- **What is the problem we are working on?**
- **Opportunity Scanning**

**TE 211 Spring**

- What does it need to do?
- Driving concept generation
- How can we do it? (a _____ that does _____)

**TE 212 Fall**

- What does it need to do?
- Engineering Design
- How can we create it?

**Parallel Development of Product, Production System & Marketing Materials**

**Conceptual Design & Product Planning**

- Mission Statement
- Final Specifications

**CONCEPTUAL**

**TECHNICAL**
Step 2: Conceptual Design & Product Planning

Our Product is our Proposed Park

Mission Statement

Identify Customer Needs → Establish Target Specifications → Generate Product Concepts → Select Product Concept(s) → Test Product Concept(s) → Set Final Specifications → Plan Downstream Development

Benchmark Competitive Products & Business Models
Build & Test Mockups, Prototypes & Business Models
Create & Manage Intellectual Property (IP)
Research & Apply Appropriate Industry, Business & Engineering Standards

Design & Develop Customers & Business Model
Customer Segments → Value Proposition → Distribution & Sales Channels → Customer Relationships

Key Activities

Key Resources

Key Partnerships

Revenue Streams

Cost Structures

(Neel & Patterson, Ochs, Osterwalder & Pigneur 2013)
IPD Step 3: Detailed Design

- Project Plan
- Lessons Learned
- Project Management
- System Design
- Development Team
  - Engineering
  - SW/HW
  - Packaging
  - Production
  - Legal
  - Marketing/Sales
  - Advertising
- Integrate & Test
- Product Data & Documentation Management
- Introduce into Market

(Lehigh University)
Key Process Questions:

- What did you do?
- Why did you do it?
- What did you learn?
- Why does it matter? (so what?)
- What’s next?
Selected Rubrics for Evaluation of Student Presentation

Rate each content statement on a 1-5 Likert scale

1. Strongly Agree
2. Agree
3. Neutral
4. Disagree
5. Strongly Disagree
Key Process Questions: (Think about these for each rubric item)

- What did you do?
- Why did you do it?
- What did you learn?
- Why does it matter? (so what?)
- What’s next?
Opportunity description is clear, concise, & complete

Team has identified customer needs, which are based on rationale & includes how their customers differ from their end user

Target specifications are derived from customer needs, consist of a metric & a value, & are prioritized & that prioritization is justified

Team understands the standards/regulations to which they must adhere
Team understands their project’s main competitors & how to effectively differentiate themselves (including sources of pertinent intellectual property)

Team has generated multiple concepts/solutions to the problem & prioritized them using the concept screening process

Team adequately demonstrated their best concept through the use of a mockup/prototype (focused vs. comprehensive, analytical vs. physical)
Team conducted concept testing with customers using the mockup/prototype for the best concept

The team has both a final production & prototype bill of materials, with appropriate reasoning (logical part costs, economies of scale, direct labor costs, etc.)

The team clearly illustrated their financial rationale (indirect labor costs, overhead, capital requirements, forecasting, etc.)
The next steps are clear, concise, & complete. The team has justified what their next steps are to progress the project forward.

The team has identified relevant risks with mitigation plans.
Presentation Questions

- Team presented as if they are articulate representatives of the company (continuity, tone, visuals, & professionalism)
- Team’s presentation reflects a semester’s worth of work
- The team told a good story about their project (captivated your attention)
- The team is able to succinctly answer questions asked
Appendix 2: Some more of student work
Industrial Heritage
“Competition” in Lehigh Valley

National Museum of Industrial History

Hoover Mason Trestle
Industry: World – Mining Historical Sites

Unesco Cornish Mining World Heritage Sites
2 RATIONALE FOR BEST CONCEPT

- Customer Segment
- Customer Needs
- Customer Metrics
- Competitive Benchmarks
CUSTOMER SEGMENT

- Homeowners of Upper Saucon Township
- Ages 30+
- Residents of Upper Saucon Township with pets
- Residents who walk trails/bike
What would make a park more desirable to attend?

Answered: 95  Skipped: 5

<table>
<thead>
<tr>
<th>ANSWER CHOICES</th>
<th>RESPONSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>History</td>
<td>10.53%</td>
</tr>
<tr>
<td>Recreation</td>
<td>51.58%</td>
</tr>
<tr>
<td>Both</td>
<td>37.89%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>95</strong></td>
</tr>
</tbody>
</table>
COMPETITIVE BENCHMARKS

Hoover Mason Trestle & Rolling Hill Park

- Virtual Reality would help separate us as a competing park
FINANCIAL RATIONALE

- **Virtual Reality**
  - Meets customer needs of wanting an interactive park experience

- **Historical Significance**
  - Signage would educate visitors on the daily life of a miner at the Ueberroth Mine

- **Corporate**
  - Future plan to create a corporate building nearby that can increase land value
  - Future employees could spend their breaks here

- **Grants and donations**
  - Land grants will help cover the actual building of the park and for future revenue, donations will be made
Three Components of Student Work

- Heritage Park
  - ‘Day in the Life of a Miner’ walking trail
- Approximately 14 signs
  - QR Code Integration
- A completed CAD model
Appendix 3: A few student projects built to their design

Mulvihill Golf Learning Center
(above: student design, right as built)
Sports Complex built based on student design.

**Education**

**Students Design Stadium for Lehigh University**

Three civil engineering students from Lehigh University worked with eight students from other disciplines to design and receive approval for a new $2.4 million, 2,000-seat stadium for the school.

The students presented the design to the school’s board of trustees in early January 1999 and will continue developing it during the spring semester. Meanwhile, the school will begin looking for donors to fund construction.

Joe Sterrett, the school’s athletic director, spurred the project and contacted civil engineering, architecture and economics professors to oversee it and select students.

The design includes a double-sided seating area between artificial turf and grass fields. Each side will have 1,000 seats and share a press box. Two buildings holding locker rooms and a concourse will sit adjacent to the bleachers.

The civil engineering students, Curtis Underwood, Mark Goodwin and James Shea, worked with professors Ben Yen and Gerald Lennon to prove that the design was structurally stable and determine that the grass field did not need an underground drainage system. The students studied local rainfall, runoff, grading and drainage patterns and found that the field would be usable most of the time without any built systems.

The students, who were not given the option of suggesting new roads or parking places, found that improved signs and careful scheduling of events at the stadium and a nearby arena could avoid traffic congestion. The students consulted contractors in developing the design to find out how to keep the project within budget.

The university will select architecture and engineering firms to verify the students’ work, but it plans to stipulate that the students be allowed to contribute and interact with the professional team. As much of the students’ work as possible will be preserved in the final design, Sterrett said.

The students said that the best part of the project was that there was no one correct solution. “The work was different than what we do in a classroom,” said Underwood. “Often a professor is trying to steer you toward one solution. Here there were a myriad of ways we could go.”

The project also opened the students’ eyes to how other professions affect civil engineering projects. “By far what the students have gained most is experience interacting with people outside their discipline,” Lennon said. ▼