Co-development of Academic and Campus Sustainability at F.I.T.: A Campus Classroom Model

Dr. Ken Lindeman
Florida institute of Technology
Dept. of Education & Interdisciplinary Studies
University Sustainability

Three components for universities:

Why university sustainability?
- Competitive advantages
  - Reduce expenses,
  - Increase revenues
- Desire to innovate
- Desire to improve society
- Student demand…
University Sustainability:

- Academics
- Campus
- Research
Applied Sustainability Education

Sustainability is one of the most important and marketable specialties available in the 21st century. Florida Tech offers multi-disciplinary sustainability education via a Bachelor of Science in Sustainability Studies and a program Minor in Sustainability. We use innovative courses, systems thinking skills, and applied projects to unravel the complexity and build real-world expertise in your areas of interest. Final projects use a campus classroom model: students address university sustainability challenges to develop marketable skills for diverse occupations. What over 750 global CEOs think: future prospects in sustainability.

Bachelor of Science in Sustainability Studies

Florida Tech's major program in Sustainability Studies expands on our well-known science and engineering strengths and combines customized business and social science courses to produce graduates that can operate across multiple disciplines in the 21st century. Four concentrations are offered: Technology & Engineering; Business & Economics; Environmental Sciences; and Social Sciences. Student capstone projects required for the major and minor programs are helping to spearhead sustainability education initiatives on-campus and around the Space Coast.

Program information is available in the Major Planning and Elective Guide and at Sustainability Studies. The major planning and electives form is used to plan diverse electives within and among the four concentration areas. Please contact Sustainability Education Program for more information on any question. Over 50 job descriptions: University Sustainability Professionals.

Undergraduate Minor in Sustainability

Florida Tech’s Minor in Sustainability is available to undergraduates from any College - Science, Business, Engineering, Aviation, and Psychology/Liberal Arts. Since 2010, students from over 15 majors from all five colleges have taken advantage of this program. The minor consists of 6 courses (2 required, 4 elective) that total 18 credits. With planning, many students can integrate most courses into their sustainability education curriculum. Two courses are required for the minor: an Introduction to Sustainability and a sustainability-related elective.

www.fit.edu/sustainability
FIT Minor Program in Sustainability started in 2010.

Surprisingly, of almost 100 colleges & universities in Florida, <10 minor programs in sustainability.

35 students/yr from all 5 F.I.T. colleges and >15 different majors.

This is *three times more* than the second most popular minor on campus at FIT (of 25 minors total).
For the Minor, 18 credit hours are required (6 classes), 2 were new classes:
- *Introduction to Sustainability* - ISC 1500
- *Applied Sustainability* (project class) – ISC 4000

Students said that they came to FIT or stayed due to the minor.

Minor capstone projects have improved campus.

Success of the minor program triggered research into the possibility of a major program…
The Path to a New Degree: The Bachelor of Science in Sustainability Studies

We could not justify building a new Bachelor program in Sustainability Studies without demonstrating that there was:
- student demand for a major degree program
- a legitimate job and career market
Student Demand

- Though definitive numbers are unavailable, student interest is reflected in the increase in university bachelor’s degree offerings, with >70 degrees now available in the U.S. – most since 2000.

- A survey of 16,000 college applicants and parents found that 66% expressed an interest in the college’s sustainability efforts and 24% said such information would “very much” impact their decision to apply to or attend the school (Princeton Review, 2011).

- Numerous national and regional newspaper articles report expanding student interest in sustainability curricula.
Over 40 B.S degrees exist with the word *Sustainable* or *Sustainability* in the title in the US.

Over 30 B. A. degrees.

There are at least 50 similar degrees in Europe, Canada, S. America, and Australia.

Africa, India, Asia?

Most are *not* at technological universities.
The Emerging Sustainability Career Landscape: Real and Growing

Jobs often focus on best management practices (BMPs) for optimization of discipline-specific systems.

There are dozens of research and management titles and occupations, some include the word *sustainability*, some don’t.

Many careers involve *interdisciplinary skills* and are shaped by the unique details of different positions:
- a company that engineers more *efficient energy systems*,
- a university/corporate partnership that *maps supply chains*,
- an gov. agency developing *natural resource management plans*,
- a NGO or law firm working on *science-based public policy*

Lists of jobs and websites are at: [www.fit.edu/sustainability/faq](http://www.fit.edu/sustainability/faq)
Sustainability professionals create and manage environmental, economic, and social systems using interdisciplinary skills across a wide array of careers. Of the global CEOs, 91% report their company will employ new sustainability technologies within 5 years (UNGC, 2019).

As campus members of the Association for the Advancement of Sustainability in Higher Education, Florida Tech students, faculty, and staff have access to many benefits to advance career tracks in sustainability studies through courses, campus projects, and research.

Sustainable systems can be created and maintained with well-designed best practices - management routines that improve resiliency and long-term production. As an international leader in education and research, Florida Tech is itself an engine of sustainability. Every day, the university serves to inform, propel, and sustain:

- **Best practices in sustainability studies and associated initiatives** through capstone research projects that connect and multiply Academic, Campus, and Research programs,
- **The discovery and application of new information and tools** through the innovative work of our student body, faculty, staff, and centers of excellence,
- **Leader development in business, government, non-profit, and educational sectors** through top-flight academic programs that graduate workforce-ready sustainability studies professionals.

www.fit.edu/sustainability
Bachelor of Science – Sustainability Studies
- Scoping concluded that a major was tractable and in demand (e.g., >70 BA/BS degrees in U.S. with more being added).
- Launched in Fall 2013. Currently only 3 other FL universities have bachelor degrees. More coming...
- Our curriculum is STEM–centric, a brand differentiator; many other programs are BA-type.
- Four concentrations are offered at Florida Tech:
  - Technol. & Engineering
  - Environmental Sciences
  - Business & Economics
  - Social Sciences.
Sustainability: Hybrid Skills Needed
Degree Requirements – Bachelors of Science in Sustainability Studies

- Candidates must meet minimum course requirements (124 total credits). These include 1 year each of: biology, calculus, physics and chemistry.

- Subsequently, 24 credits of restricted electives from the four Program Concentrations are required as follows:
  - Environmental Sciences minimum of 6 cr (ES)
  - Technology & Engineering minimum of 6 cr (TE)
  - Business & Economics minimum of 6 cr (BE)
  - Social Sciences minimum of 6 cr (SS)

- To encourage students to focus on areas of greatest individual interest, students take an additional 15 credits from one or more of the program concentrations in consultation with their academic advisor.

- These electives are termed “Concentration Courses” in the program planning guide. The 15 credits can come from any courses in the list of program electives.
- A collective commitment is growing across campus to make Florida Tech a sustainability leader.

- A *campus classroom* model is fundamental – academics & campus efforts are *unified* as possible.

- An ontogenetic (i.e., developmental) process. Many opportunities and strategic are open for strategic exploration as this program grows...

- This requires both a top-down & bottom-up approach.
- Final projects use a *campus classroom model*: students build campus projects to develop marketable skills and operationalize best practices.

- New campus products and services are being created by new *Student-Staff-Faculty Teams* including:
  - Dormitory Recycling  - Sustainable Dining
  - Sustainable Events  - Land & Water
  - Campus GIS  - Sust. Buildings
Florida Tech: Campus & Community Sustainability Initiatives – Nov 2013

Sustainable Buildings
- New Construction:
  - Aquatic Center
- Existing Bldg Operations:
  - Ruth Funk Center
  - WFIT Studios
- Campus GIS Datalayers
- Community Datalayers

Spatial Analysis

Recycling
- Workspace Recycling
- Electronics Recycling
- Dormitory Recycling
- Landscape Recycling
- Web Site Content Management

Project Manag. & Communications
- Inform. Services; Social Media
- Composting System
- Rainwater Harvest
- Invasive Plant Mitigation
- Jungle Species Inventories

Land-Water

Sustainable Events
- Campus Events
- Community Events
- Compost Sourcing
- Dining Oil - Van Fuel

Dining Services
- Organic Coop
- Certified Products
- Energy Manag.

Green IT
- Electronics Recycling

Red: Student Teams
White: Student Projects

1 Corporate Support: Siemens & Waste Manag.
2 Internships: Smooth Running, Inc., Keep Brevard Beautiful, Woman’s Business Center, & International Student Scholar Services
ISC 4000
Applied Sustainability, SP 14

Course projects

All students (24) are in the Sustainability minor or major
Merging many diverse disciplines produces new concepts and vocabularies

- Energy poverty
- Solar shingles
- Climate refugees
- Failed states
- Microcredit
- Social traps
- Triple bottom line
- Rainwater harvesting
- NGO
- Grasstips
- BMPs
- Vampire power
Thinking in Systems, Meadows (2008)

- Feedback Loops
  - Amplifying
  - Stabilizing
- Limits control systems (bottlenecks)
- Limits are numerous and layered
- Response Delays are common and extended
- Bounded Rationality…
- SYSTEM TRAPS
• Negative feedback causes system outputs to lessen - and to trend the system to equilibrium.

• - *equilibrium* in mechanics
  - *homeostasis* in biology
  - *rules/regulations* in law and government.
Sustainable Systems require Dynamic Equilibrium which is undone by Uncontrolled Feedback Loops which create System Traps
System Traps  (Meadows, 2008)

Success to the Successful  (= Winner Take All; The Monopoly Effect)

Seeking the Wrong Goal

Shifting the Burden  (= Addiction…)

Rule Beating

Drift to Low Performance

The Tragedy of the Commons

Escalation
FIT Virtual Climate Adaptation Library
>1400 pdfs on adaptation tools for coastal areas by state country.

Search: “Sea Level Rise Library”
University Sustainability:

- Academics
- Campus Facilities
- Research
Students as Innovators

Diverse student, staff, faculty, and community partners have started new sustainability initiatives. Some programs combine academic courses and student capstone projects to produce innovations on and off campus.

Sustainability capstone projects use a campus classroom model: students develop and manage real-world sustainability projects to generate solid learning experiences and sharpen marketable skills. These efforts include student-staff-faculty teams working on issues such as:

- **Recycling**: Projects include electronics, dormitory, and workspace recycling. Best practices are reinforced by e-mail, social, and print media products with the communications team and Facilities Operations - Recycling. Corporate donors include Siemens Engineering and Waste Management.

- **Sustainable Buildings**: Students assist implementation of best practices in building management systems. Students have worked on diverse LEED and FGBC credits on energy, indoor air, water management, and other systems with buildings staff in Facilities Operations.

- **Dining Services**: Sourcing of food waste for the composting project, expansion of certified sustainable coffee options, and cooking oil to power university vehicles are among the projects scoped or implemented for on-campus dining options.

- **Land & Water**: Students and staff maintain a vermicomposting system using waste from two campus dining halls (S15 and Panther Dining Hall). Both soil and liquid tea used as fertilizer is harvested from these facilities.
Campus Classroom Products include:

**Sustainable Buildings**
- New Construction:
  - Aquatic Center
- Existing Bldg Operations:
  - Ruth Funk Center
  - WFIT Studios

**Recycling**
- Workspace Recycling
- Electronics Recycling
- Dormitory Recycling
- Landscape Recycling
- Web Site Content Management

**Project Manag. & Communications**
- Inform. Services; Social Media
- Composting System
- Rainwater Harvest
- Invasive Plant Mitigation
- Community Datalayers
- Compost Sourcing
- Dining Oil - Van Fuel

**Dining Services**
- Organic Coop
- Certified Products
- Energy Manag.

**Green IT**
- Electronics Recycling

**Spatial Analysis**
- Campus GIS Datalayers
- Community Datalayers

**Land-Water**
- Invasive Plant Mitigation
- Jungle Species Inventories

**Campus Events**
- Community Events
- Compost Sourcing
- Dining Oil - Van Fuel

1 Corporate Support:
Siemens & Waste Manag.
2 Internships:
Smooth Running, Inc., Keep Brevard Beautiful, Woman’s Business Center, & International Student Scholar Services
Campus & Facilities Sustainability

Siemens Energy Savings Performance Contract

• New 1,000-ton Central Water Plant powered by two state-of-the-art high efficiency turbo-core chillers
• Installation of office lighting motion sensors and window solar film across campus
• Annual reduction of 6,500 tons in greenhouse emissions
• Major annual electricity savings campus-wide (approximately 27%; 8,000,000 KWh)
Solar-Powered Maintenance Fleet

Facilities Management reduced carbon emissions and fuel costs by replacing some of its gas-powered fleet with electric carts and building a solar-charging station.

These university carts recharge by drawing from the grid at night, when rates are lower.
The Botanical Gardens: Our Unique Jungle

- 16-acre subtropical preserve and flood plain that contains more than 200 species of palms, bamboos, and ferns.

- Cited in the AAA Travel Guide and used by F.I.T. students for outdoor recreation and studying for over 50 years.
Sustainable Buildings: Student - Facilities Team Products

- LEED = the global building standard that incentivizes underused best practices.
- Ultimately saves energy & water $$
- Four rating levels based on credits earned among dozens of sustainability criteria:
  - SILVER
  - GOLD
  - PLATINUM
  - CERTIFIED
Student Sustainability Projects for LEED

• Academic partnerships with Facilities as part of Sustainability class projects:
  • Students *assess and document specific credits needed* to achieve certification.
  • Outside firms often bill $1.5K per credit, but we minimize these expenses by using student projects.
University Sustainability:

- Academics
- Campus Facilities
- Research
Sustainability is a theme in funded faculty research across many departments and all colleges. Direct and indirect sustainability research occurs among dozens of faculty members and includes:

- ecosystem monitoring and conservation,
- cyber security,
- coastal management,
- groundwater quality and storm water management,
- corporate social responsibility,
- aquaculture of food and ornamental fish species
- paleoecology and climate change,
- green chemistry
- recycled materials in road construction,
Next steps common to the development of university sustainability programs:

- Campus sustainability certification via STARS
- Campus climate plan and GHG inventory

These two fundamental steps (and others) won’t properly happen without a:
- Campus Sustainability Director
What is STARS?

• **Sustainability Tracking, Assessment & Rating System**

• The premier university campus sustainability eco-label

• A voluntary, self-reporting framework

• A common standard of measurement for sustainability in higher education

• Managed by AASHE…
AASHE: Association for the Advancement for Sustainability in Higher Education

• An association of colleges & universities working to “Empower higher education to lead the sustainability transformation”

• Over 1000 college/university members.

• Professional home for campus sustainability officers.

• Accreditation home for STARS
The Sustainability Tracking, Assessment & Rating System™ (STARS) is a transparent, self-reporting tool for colleges and universities to measure their sustainability progress. STARS® was developed by AASHE with broad participation from the higher education community. The system includes environmental, economic, and social indicators, which are divided into four categories related to campus activities: Education & Research, Operations, Planning, Administration & Engagement, and Innovation. All of the requirements for evaluating and scoring institutions are transparent and made publicly available. Points are earned in each category and lead to a STARS Rating (listed below). Any institution that wishes to participate in STARS but does not want to publish its scores may participate as a STARS Reporter.

STARS:
• Provides a framework for understanding sustainability in all sectors of higher education.
• Enables meaningful comparisons over time and across institutions using a common set of measurements developed with broad participation from the campus sustainability community.
• Creates incentives for continual improvement toward sustainability.
• Facilitates information sharing about higher education sustainability practices and performance.
• Builds a stronger, more diverse campus sustainability community.
Other Next Steps at F.I.T.
- all depend on additional funding

- Additional LEED or FGBC buildings

- Expanded solar energy generation - when possible as cost/benefit analyses suggest

- Endowed funding support

- Many other items (see STARS list of credits)
Questions?
The Academic Program?
Sustainability Research?
Jobs and Sustainability?