



MODELS FOR TEACHING INTERDISCIPLINARY BIOFUELS SCIENCE: A MULTIPRONGED APPROACH

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Objectives of the FIU-Agroecology Program

- ❖ Continue to offer a comprehensive agroecology program at FIU by targeting under-represented populations and a significant number of freshmen from high schools and transfer students from Miami Dade College with agriculture sciences background
- ❖ Incorporate scientific instrumentation into the agroecology curriculum
- ❖ Establish campus organic garden to provide students with hands on experience
- ❖ Develop and incorporate biofuels education and research skills into the agroecology program

USDA-NIFA-HSI Biofuels Education Grant

- ❖ Train undergraduate and graduate students of in the area of *bioenergy science and technology*.
- ❖ Implement a comprehensive *hands-on training and field internship program* in the area of biofuel science and technology.

Renewable Energy Sources - Biofuels

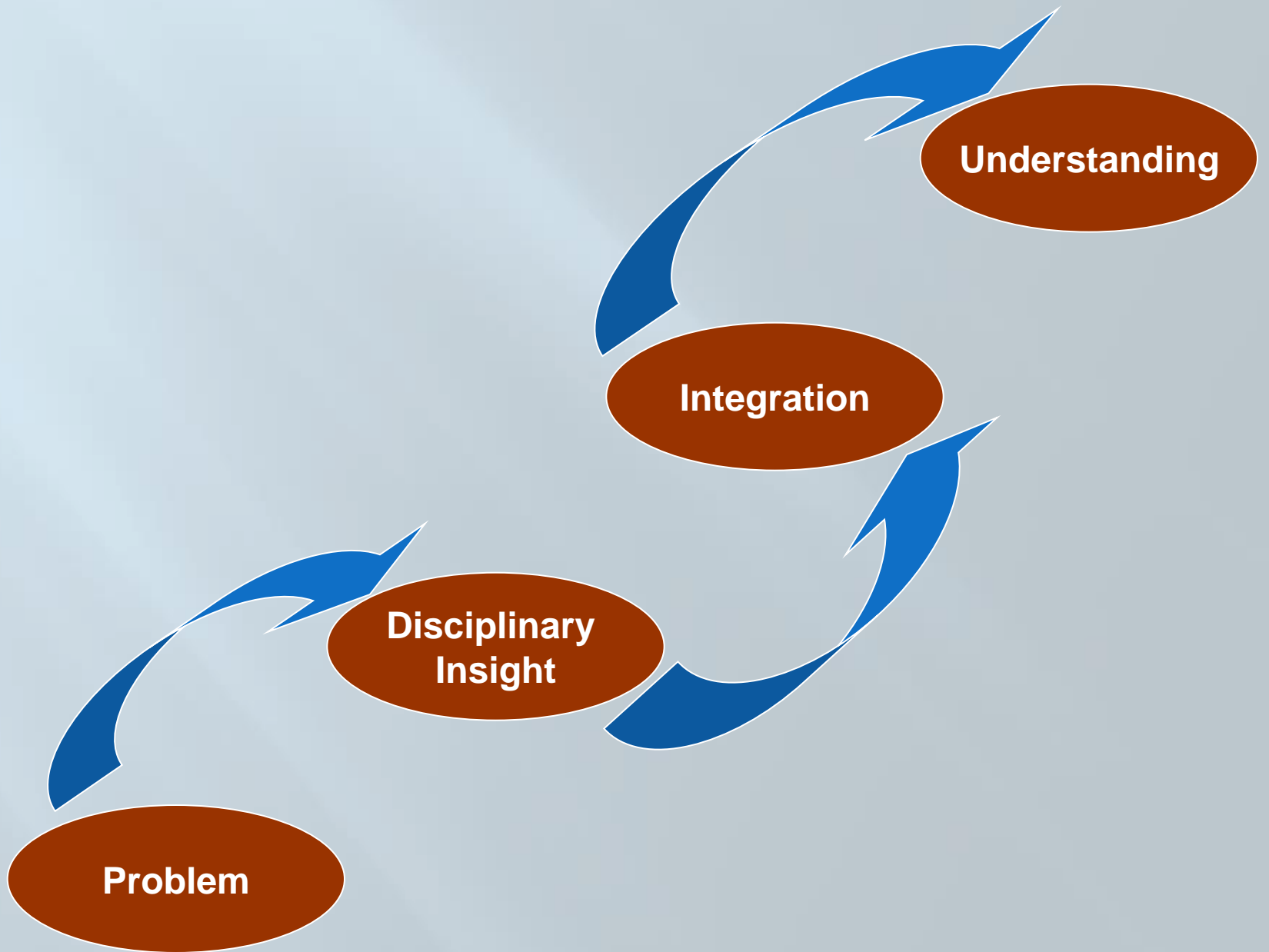
- ❖ **Source of income and support community**
- ❖ **Energy Self-Reliance**
- ❖ **Biomass Recycle – Nutrient source**
- ❖ **Energy efficiency**
- ❖ **Climate Change**

Myth: Interdisciplinary work is superficial

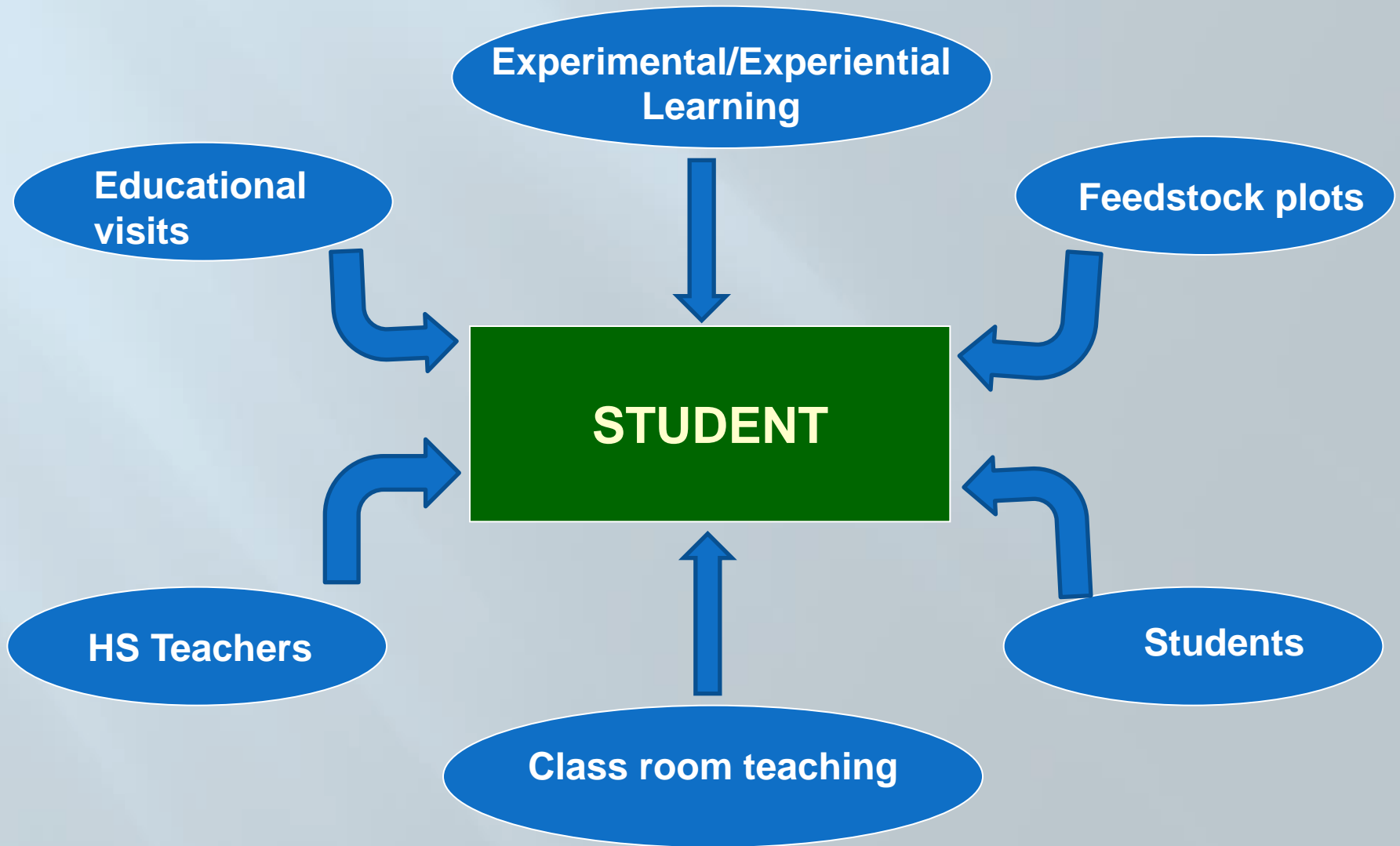
Myth: Interdisciplinary threatens the disciplines

Quality interdisciplinary education

- ❖ Invites students to integrate concepts, theories, methods and tools from two or more disciplines.
- ❖ Deepen their understanding of a complex topic.
- ❖ Interdisciplinary instruction enlists students' multiple capabilities (aesthetic, social, analytical) and
- ❖ Prepares them to solve problems, create products or ask questions in ways that go beyond single disciplinary perspectives.



Facilitated Knowledge Diffusion



Class room teaching

- ❖ **Freshman undergraduates**
- ❖ **Sustainable Agriculture class**
- ❖ **Sustainable Bioenergy class**
- ❖ **Guest lectures**
- ❖ **Projects**

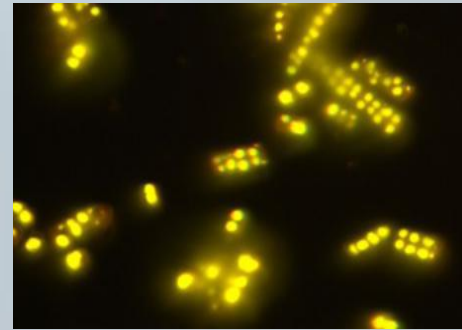
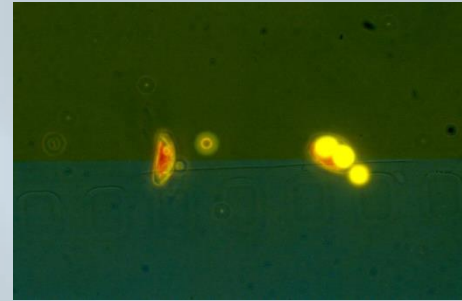
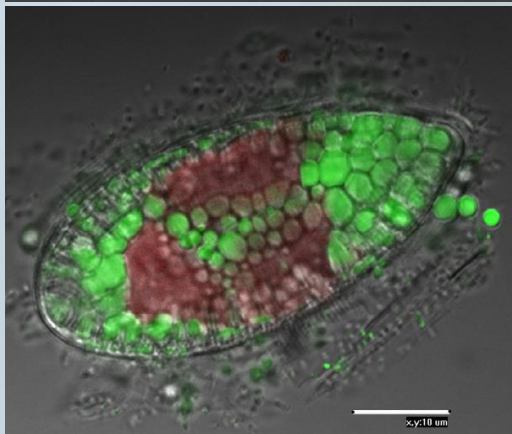
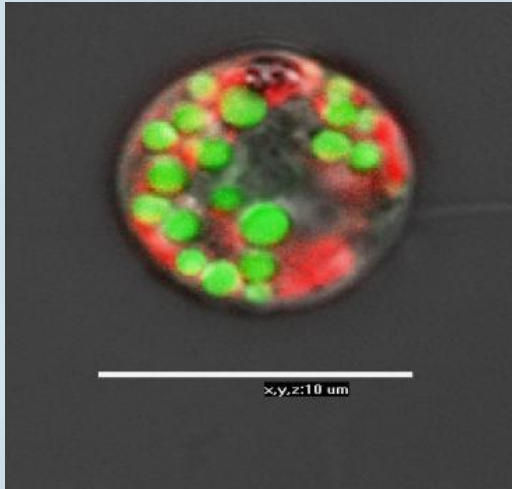
Experiential and experimental learning

- ❖ **Conduct research on sustainable biodiesel crops**
- ❖ **Conduct research on algae**
- ❖ **Project on biodiesel production**
- ❖ **Project on biomethane production**



Project on biodiesel production using waste vegetable oil

Screening for algal lipid accumulation with Nile red



Educational Tours

- ❖ **Biodiesel and biofuel research centers in India**
- ❖ **Green Biodiesel company, Miami, FL**
- ❖ **Univ. of Florida, TREC research station, Homestead, FL**
- ❖ **Algenol, R & D facility, Fort Myers, FL**
- ❖ **Florida Crystals, Clewiston, FL**
- ❖ **FIU Advanced Research Center facility**

TREC's space experiments



Dr. Wagner Vendrame
Tropical Research and
Education Center, UF/IFAS



- ❖ **FIU organic garden**
- ❖ **Grow biofuel trees (*Jatropha*, *Simarouba*)**
- ❖ **Experimental field**
- ❖ **Sugarcane**
- ❖ **FIU Algae collection facility**
- ❖ **Biodigester**

Jatropha curcas



Simarouba glauca



Biodigester for methane production



High school teachers

- ❖ **Conducted several summer training workshops, one exclusively on biofuels**
- ❖ **Guest lectures**
- ❖ **Visits to lab and field**

Student Interactions

- ❖ **Between university and high school students**
- ❖ **Between undergraduates and graduates**
- ❖ **International students**

High school students

2011 USDA – FIU Internship for
Fairchild Challenge High School
Students: Biofuels







Lessons Learned

- ❖ **Majority of the high school teachers and students who participated in the workshop responded favorably (very good to excellent) in terms of content, relevance, field trip/demonstrations, interaction and understanding.**

Lessons Learned

- ❖ **Collaboration between university, K-12, research institutions, private companies, and staff, outreach personnel**
- ❖ **Time for planning, preparation and promotion**
- ❖ **Communication**
- ❖ **Involvement**

Challenges

- ❖ **Time constraint for certain groups**
- ❖ **Minimal education tools for certain groups**
- ❖ **Program reach**
- ❖ **Expansion of presenters –topics with broad interest and applicability**

The Multipronged Approach has helped

- ❖ Increase in student awareness and interest in biofuel science related current events.
- ❖ To connect and integrate knowledge and skills from across disciplines to solve problems.
- ❖ Comfortable with complexity and uncertainty.
- ❖ To work collaboratively with others.
- ❖ Expand cooperative network.

Thank You

<http://agroecology.fiu.edu>

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Luke Thema, Sara Acado, Stephany Alvarez**

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USDA-NIFA-Biofuel Education 2010-38422-21261

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Collaborators, Partners, Faculty, and Students