

Bioenergy Education Initiative at Oregon State University

USDA-NIFA. 2011-68005-30407. "System For Advanced Biofuels Production From Woody Biomass In The Pacific Northwest". Regional Approaches to Sustainable Bioenergy Regional Coordinated Agricultural Project (CAP). PI Rick Gustafson, University of Washington.

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Bioenergy Education Team

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Program Staff

Kate Field: Program Leader

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Glen Li: Instructor / Advisor

Jay Well: Program Coordinator

Renee O’Niell: SMILE Coordinator

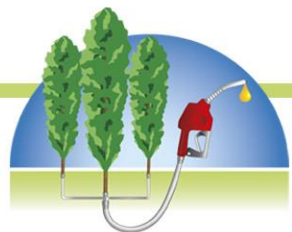
Graduate Students

Kimi Gryzb: Ph.D., Environmental
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Briann Hartman,: Ph.D., Science
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Adam Talamantes: Ph.D., Science
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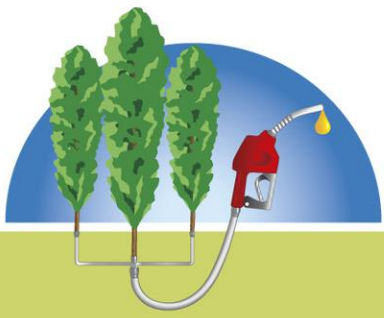


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AHB BIOENERGY EDUCATION PIPELINE:

- Family and Community Programming
- Pre-College Programs
- Community and Technical College Workforce Development
- Bioenergy Summer Bridge (BSB) to College Program
- Undergraduate Bioenergy Education
- Masters-level Programs



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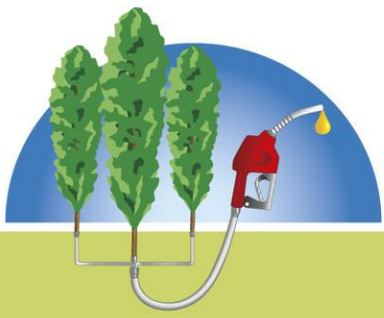


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Importance of Bridge Programs

- Historically supports student retention and graduation rates
- STEM focused bridges
 - used research projects to address equity, access, and specific academic skills, usually college or program specific but not usually assessed.
 - Used to support under represented students (URS) URS tend to change from STEM to non-STEM majors more frequently when compared to more traditional students
- We propose that bridge programs that serve URS in STEM and Non-STEM majors can use a STEM research project to support academic skills and interest in STEM.





Bioenergy Summer Bridge

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Design: 14-day residential Bioenergy Summer Bridge (BSB)

- Uses Bioenergy as an access point and to represent STEM
- Assist URS with their transition to college using authentic experiences to simulate college classes, promote student connection to resources, and facilitates supportive peer groups
- Connects students directly to bioenergy research (regional and local), minor program, and connects with other bridge programs
- Goal is to increase student retention and success of all students, and to promote interest in Bioenergy and STEM
- Attempt to address the needs of STEM and non-STEM majors using a Problem-Based Learning approach (PBL)

Delivery: 11 students in 2012, 24 in 2013, 32 in 2014, 13 in 2015, and 32 in 2016



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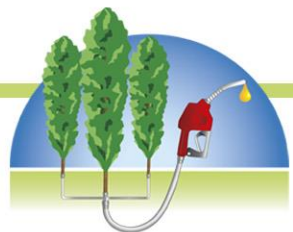
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Provide short bioenergy situations to research teams

- Presents STEM in technical and socioeconomic context
- Provide needed background information (3 paragraphs)
- Have clear steps to take accomplish the project
- Parents play the role of the audience during commencement

“Your team is commissioned with the task to 1) select **one energy product** for garbage utilization, 2) identify a **technology** for producing the energy product of your choice, and 3) demonstrate the **advantages and risks** associated with this technology. Strategic decisions will be made by the Board of Trustees of Castor Recycling based on your research and your presentation.” (Situation #2, Garbage-to-\$\$\$)





Supporting PBL in the BSB

Facilitate by providing initial information, clear goals, tools, and sessions

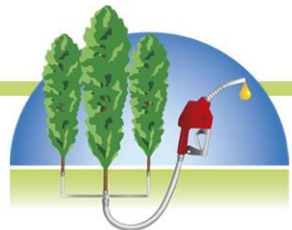
- Couple direct instruction (e.g. bioenergy history, uses, and conversion pathways) with sessions on team work, searches, powerpoint, google docs, and presentation skills
- Use worksheets to tease out important aspects of the situation

“This is a working document that will help frame your initial research articles and your library research time. Please fill out one per group member. *Each members of the group can be different.*”

Describe your situation **in your own words**:

From the situation handout, what is the **key background information** presented?

What do you **need to know** to find a solution?” (Initial Library Assignment)





Resulting Student Products

Bioenergy Research Project

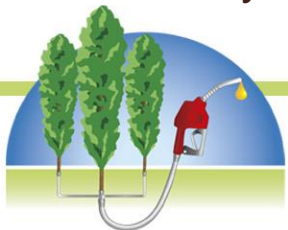
- An oral presentation to their families at the conclusion of the program
- Position students as *experts of a defensible solution* (define a problem, use evidence, and counter a claim)
- Use tools (to focus project), and library sessions, peer groups, and academic coaches

Goal: Refine academic skills and utilize campus resources in a supportive community

Academic Self Poster

- Academic poster using campus printing, and PowerPoint class
- Builds on personal and academic reflections throughout the program
- Communicate to guests challenges, strengths, first year plan, and journey to OSU
- Poster walk with families as audience

Goal: Awareness, preparation, and to facilitate a conversation with students and their families





Assessment of Programing

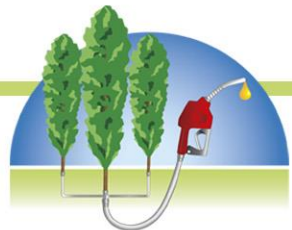
Research Design & Methods

What is the impact of the BSB Research project on college student self-efficacy, academic skills, STEM and Bioenergy interest, and connection to OSU?

- Mixed Methods
- Pre-, post-, and delayed-surveys
- Used broad and targeted assessment strategies

Survey Elements

- Social cognitive theory views BSB as a mastery experience for incoming students
- STEM interest & career interest
 - Success in a STEM major at OSU
 - Bioenergy Interest
- College self-efficacy
 - Success at OSU
 - Related project skills
 - Specific OSU resources





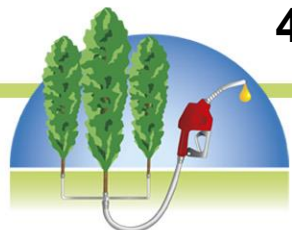
The students who participated

2015 Bioenergy Summer Bridge Cohort		(n=10)	
Ethnicity		%	Home Town
Asian/Asian American	20	Rural	30
Hispanic	40	Urban	60
White	30	Unsure	10
More than one	10		
Gender		High School GPA	
Female	60	Average	3.54
Male	40	Range	2.75-4.00

Incoming Major (n=13)	
Animal Sciences	General Engineering
Business	Mechanical Engineering
Chemistry	Microbiology
Computer Science	Nuclear Engineering
Electrical Engineering	Physics
Environmental Sciences	Political Science, Env. Policy



40% of the students indicated they were 1st generation





STEM, OSU Major, & Bioenergy

STEM Major at OSU

- Perceived success and interest
- Alpha .89, 3 items, 5pt scale

STEM Career Interest

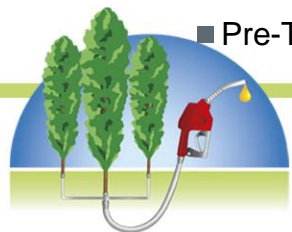
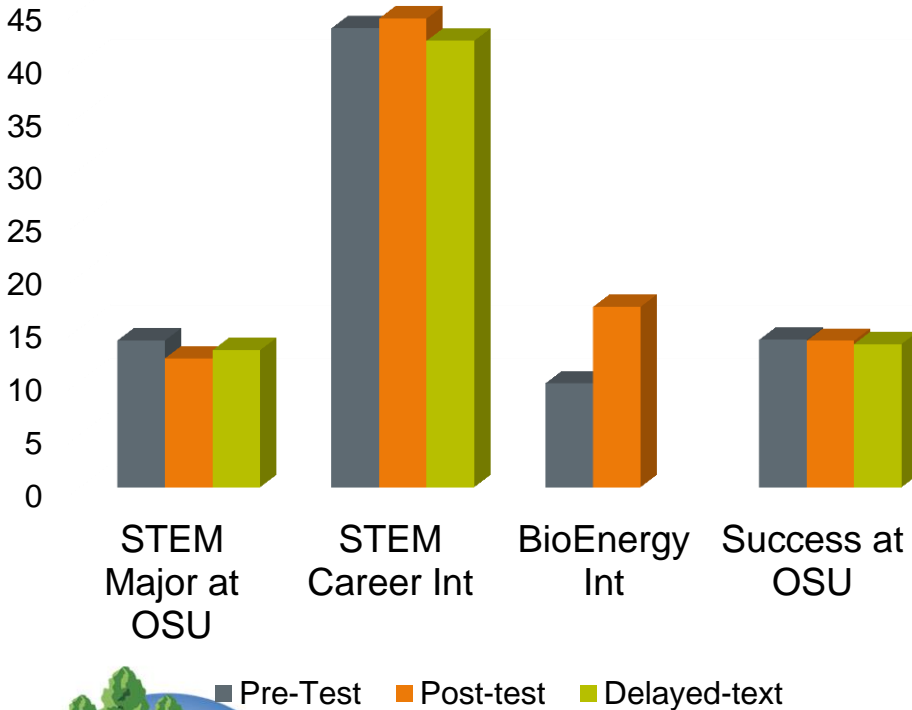
- Built on 4 scales
- Alpha .84, 11 items, 5pt scale
- Alpha would have been higher if questions about “model” and “family had been removed.

Bioenergy Interest

- Alpha .89, 4 items, 5pt scale
- Increase of 42%
- Bioenergy was noted as a good example of an integrated STEM field

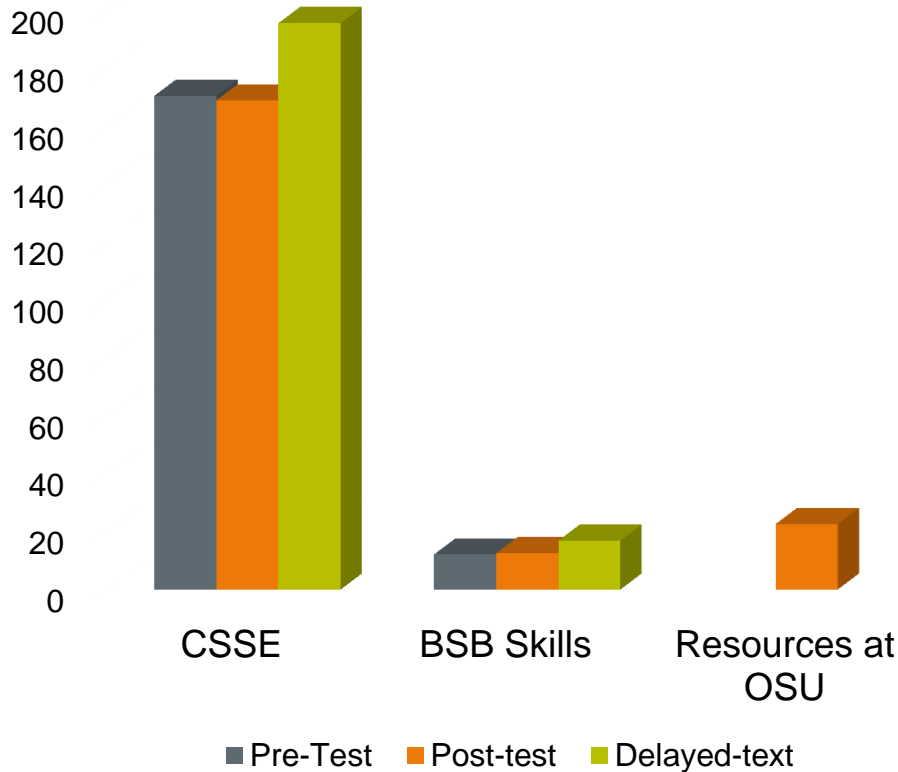
Success at OSU

- Alpha .78, 3 items, 5pt scale
- Confidence in graduating 1st year, returning for 2nd year





Efficacy, BSB Skills, and Resources



College Student Self-Efficacy (CSSE)

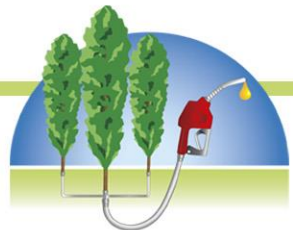
- Alpha .88, 26 items, 10pt scale
- Better predictor than GPA of 1st year students

BSB Skills

- Alpha .78 (delayed), 4 items, 5pt scale
- Presentations, group projects, strengths/weaknesses, and confidence with student resources(email, library, printing, etc.)

Resources at OSU

- Alpha .80, 5 items, 5pt scale, avg 22.5 (A to SA), comfortable using CAPS, cultural centers, writing center, study halls, financial services





Correlations

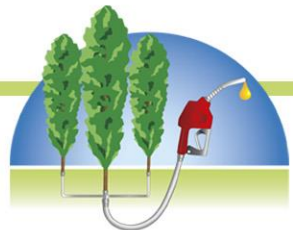
Post-test

- Resources & Bioenergy Interest
 - $r_s: .59 p < .05$
- OSU Success & Bioenergy Interest
 - $r_s: .66 p < .05$
- College Self-Efficacy & Resources
 - $r_s: -.64 p < .05$

Delayed-test

- CSSE & STEM Career & Interest
 - $r_s: .75 p < .01$

$r_s > .50$ (Large/Substantial)





Connection to OSU

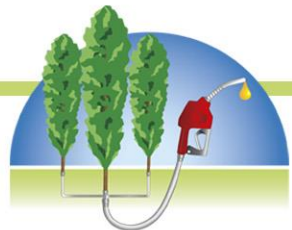
Key Findings

- **Connection to OSU resources and people**

“The Bridge taught me about the resources around campus and showed me how helpful and friendly people around here are. Because of that, OSU is starting to feel more like home. Now I know that I can go to many places to seek help should I need it.”

“I was able to learn about all different kinds of resources on campus and meet new people that I knew I will remain in contact with for many years to come.”

“The most useful part was the resources the program introduced me to. The challenging part to the program was the workload while maintaining a social aspect to college.”





BSB Project & Academic Skills

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Key Findings

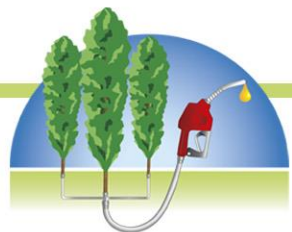
- **Challenging students and refining academic skills**

“It helped me gain better research and studying skills along with skills that allow me to write effective presentations.”

“The Summer Bridge Program was helpful in teaching me good notetaking and presentation skills.”

“It helped me develop time management, intelligence, discipline, and organization”

“The challenging aspect of the Summer Bridge was actually doing the research project, and finding ways so that everyone can work and work to the best of their abilities.”



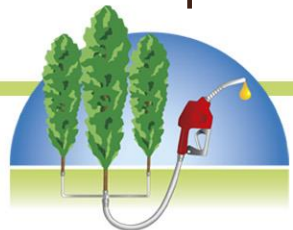
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- Bridge programs can use PBL STEM research projects to support URS' STEM interest, self-efficacy, connection to institutional resources and peer groups, and refine academic skills
- PBL STEM research projects can expose students to academic resources and social groups they will find useful even after the bridge has concluded
- PBL STEM research projects can support academic skills across diverse groups of STEM majors
- Students may find the project challenging (e.g. time, writing, and group work), while balancing the project with social aspects of a bridge program
- Students may attend to specific resources on they feel will be most helpful to them





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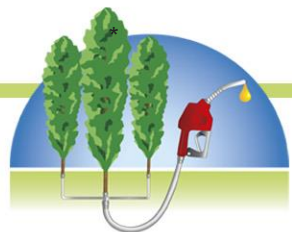
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***indicates used in survey tool design.**



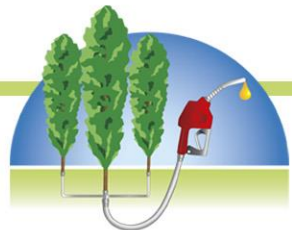


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Thank you!
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Questions

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