

# Environmentally Responsible Engineering: Building capacities for leading the change

Engineering Change Lab - USA  
Virtual Conference  
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## Agenda

- ▶ About VentureWell
- ▶ Addressing the Gap
- ▶ The ERE Framework
- ▶ ERE & Leadership

**Download ERE  
Framework:  
[bit.ly/3dXQZly](http://bit.ly/3dXQZly)**



### **ENGINEERING FOR ONE PLANET:**

Definition and Framework for  
Environmentally Responsible Engineering



## Our Origin

Jerry envisioned a  
program

that would foster the next  
generation of collegiate inventors

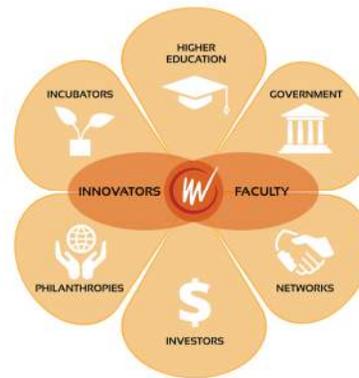
and help them bring  
their ideas to impact



## VentureWell's Mission

We are striving to...

- ▶ cultivate a pipeline of **inventors, innovators, and entrepreneurs** (students & faculty)
- ▶ who are driven to **solve the world's biggest challenges.**



# VentureWell's Funders & Partners



# Three Pillars of VentureWell's Work

## Support Early-Stage Innovators

We support innovators in bringing their ideas to market through:

- Workshops & training
- Coaching & mentoring
- Funding
- Competitions

## Support Institutional Change Agents

We support faculty in developing programs that cultivate & support university innovators and promote institutional change through:

- Grants
- Workshops & training
- Conferences
- Communities of Practice

## Strengthen I&E Ecosystems

We strengthen the innovation & entrepreneurship ecosystem through:

- Facilitated networks
- Convenings
- Virtual networks

**Learn more:**

<https://venturewell.org/>

## The Gap

**70%**

personal sustainability  
of “utmost”  
importance

**THE GAP**  
between  
values,  
skillsets &  
mindsets

**60%**

Had not considered  
environmental impacts  
of their designs

# Addressing the Gap

Free Sustainability Resources @VentureWell

- ▶ Faculty Grants (spring & fall cycles)
- ▶ Tools for Design & Sustainability
  - ▶ Autodesk Sustainability Workshop Series
- ▶ Inventing Green Toolkits
- ▶ Environmentally Responsible Engineering

***Access here:***

<https://venturewell.org/>



## The Aspiration

- ▶ Ensure all **engineering professionals** are equipped with the **fundamental competencies & skills** in environmentally responsible engineering (ERE) by **transforming engineering education**.



### ENGINEERING FOR ONE PLANET:

Definition and Framework for  
Environmentally Responsible Engineering

## ERE Preliminary Steps

- ▶ Background **research & interviews**
  - ▶ 2017-2019
- ▶ Focused expert **roundtables & briefs**
  - ▶ 2018 & 2019
- ▶ Summarized work to date with **white paper**
  - ▶ July 2019

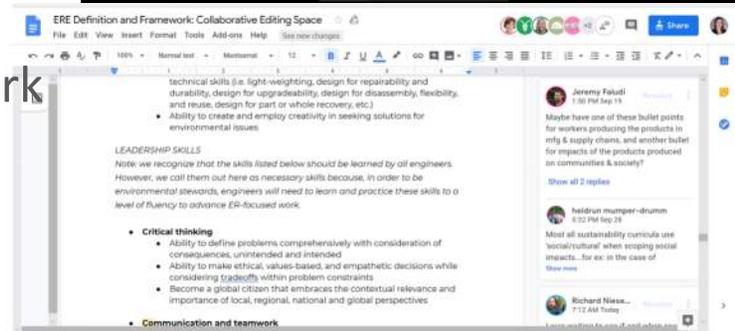
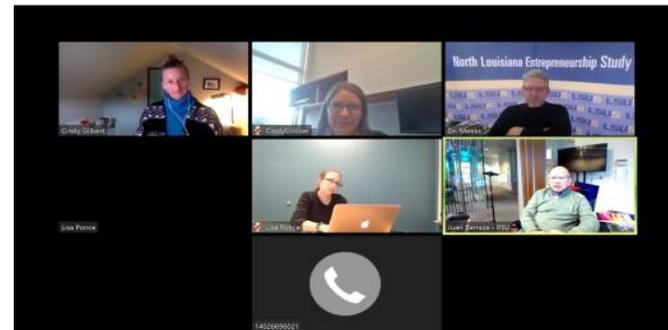
>>>Learn more:

[https://venturewell.org/  
environmentally-responsible-engineering/](https://venturewell.org/environmentally-responsible-engineering/)



# The Co-development Process

- ▶ Input from **200+** stakeholders to create first draft framework
- ▶ **Open commenting period & online convos**
  - ▶ Sept-Nov 2019
  - ▶ **90+** ppl
  - ▶ **430+** comments
- ▶ **Launch** draft ERE Framework Feb 2020



## Next Steps

- ▶ Launch ERE Pilot Program Grant Cycle
  - ▶ March 2020
  - ▶ \$30K grant awards / 2 years (2020-2022)
  - ▶ 5 institutions (diversity in region, size, etc.)
- ▶ Launch Community of Practice
  - ▶ August 2020
- ▶ Revise & finalize ERE Framework
  - ▶ Dec 2020

[>>>go.venturewell.org/ERefeedback](https://go.venturewell.org/ERefeedback)



## What is the ERE Framework?

- ▶ “The WHAT”
- ▶ The **curricular content** that all engineers should be **exposed to & acquire** to design with the planet & people in mind
  - ▶ What do they need to **know**?
  - ▶ What do they need to be **able to do**?
    - ▶ Aligned with **ABET’s student outcomes**
    - ▶ Aligned with **UN SDG #12**
      - ▶ *Ensure sustainable consumption and production patterns.*
- ▶ Not “the HOW”



## The ERE Framework: Structure

- ▶ ERE Framework's **3 categories** of **core & advanced** student learning outcomes:
  - ▶ *Systems thinking (central)*
  - ▶ *Knowledge & understanding*
  - ▶ *Skills, experiences & behaviors*



**Environmentally Responsible Engineering: Core Student Learning Outcomes**  
 Cross-referenced with Engineering Accreditation Requirements and United Nations Sustainable Development Goals



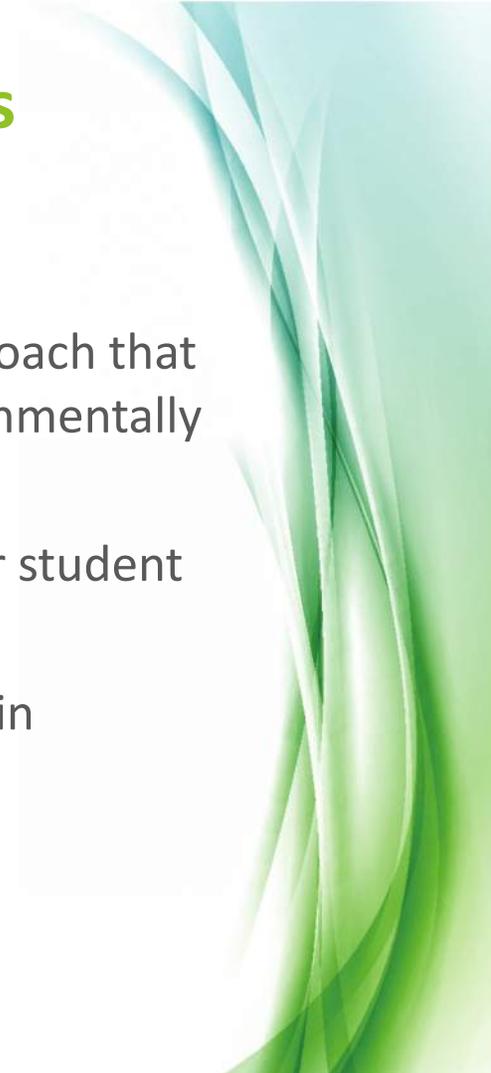
**Legend**     $\Delta$  is used to denote when a Framework student learning outcome is directly tied to The Accreditation Board for Engineering and Technology student outcome as described in Criteria 3.     $\infty$  is used to denote when a Framework student learning outcome is directly tied to the SDG Goal #12 learning outcomes.



# The ERE Framework: Systems Thinking

Systems thinking is...

- ▶ the most fundamental concept & approach that students must learn to become environmentally responsible
- ▶ central & interconnected with all other student learning outcomes
- ▶ what all designs rely upon & exist within



## Building Capacity to Lead Change



## The ERE Framework: Leadership Skills

### Leadership Skills

- ▶ critical thinking
- ▶ communication + teamwork

*Note: The community of collaborators recognized that while the skills in this section **may not typically be identified as specific to engineering**, they are necessary to enable engineers to be successful environmental stewards and collaborations across disciplines.*

***Notably, all core leadership skills align with ABET student learning outcomes!***

# Key Takeaways to Lead Change

## Critical Thinking Skills (pg21)

- ▶ Considers consequences: intended & not
- ▶ Makes ethical decisions & choices
- ▶ Promotes values, empathy & guardianship
- ▶ Understands normative thinking
- ▶ Knows every person has a role & the right to know

## Communication Skills (pg22)

- ▶ Explains ideas & advance learning
- ▶ Advocates for underrepresented groups
- ▶ Drives org-level change & maximize team effectiveness
- ▶ Works well with others, across disciplines & cultures



## David Suzuki

*“Change is never easy, and it often creates discord, but when people come together for the good of humanity and the Earth, we can accomplish great things.”*

--David Suzuki



## David Suzuki

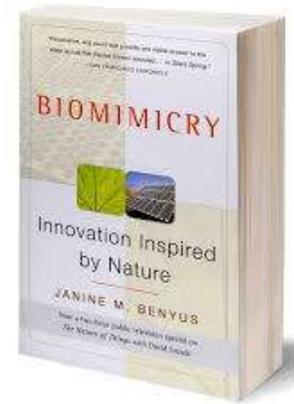
- ▶ Ethical decisions & choices
  - ▶ Even when it's unpopular!
- ▶ Values, empathy & guardianship
  - ▶ Puts the next generation first
- ▶ Normative thinking
  - ▶ Reflective & examines how experiences & values inform his beliefs & thinking (e.g. Japanese interment at 6)
  - ▶ *"The way you see the world shapes the way you treat it."*
- ▶ Every person has a role & the right
  - ▶ Speaks for all species
  - ▶ Attuned to voices of elders, esp. first nations
- ▶ Communicator
  - ▶ Cross cultural & cross generational storyteller



## Janine Benyus

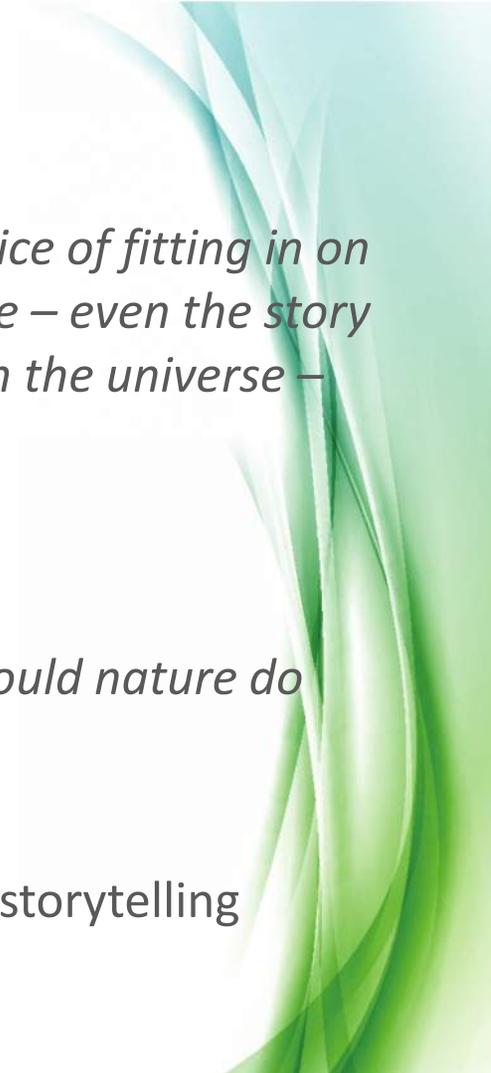
*“What if, every time I started to invent something, I asked, ‘How would nature solve this?’”*

--Janine Benyus



## Janine Benyus

- ▶ Ethical decisions & choices
  - ▶ *“If we are to use our tools in the service of fitting in on Earth, our basic relationship to nature – even the story we tell ourselves about who we are in the universe – has to change.”*
- ▶ Normative thinking
  - ▶ Reflects, listens & learns
  - ▶ Seeks new perspectives (i.e. *“how would nature do this?”*)
- ▶ Communicator
  - ▶ Core to sharing messages is through storytelling



## My Leadership Practice

- ▶ Consider consequences
  - ▶ All actions & decisions have consequences
- ▶ Ethical decisions & choices
  - ▶ Alignment of work & values
  - ▶ Stepping & speaking up, even when it's tough
- ▶ Values, empathy & guardianship
  - ▶ Putting community over the individual
  - ▶ Long-term v. short-term thinking
- ▶ Normative thinking
  - ▶ Acknowledge history, bias & privilege
  - ▶ Listening, learning & leaning into discomfort to grow & change



We'd love your feedback on the ERE  
Framework & how it can support your  
efforts!

**Feedback form:**  
**[go.venturewell.org/EREfeedback](http://go.venturewell.org/EREfeedback)**

[cgilbert@venturewell.org](mailto:cgilbert@venturewell.org)

**THANK YOU!**