



Reaching Resilience

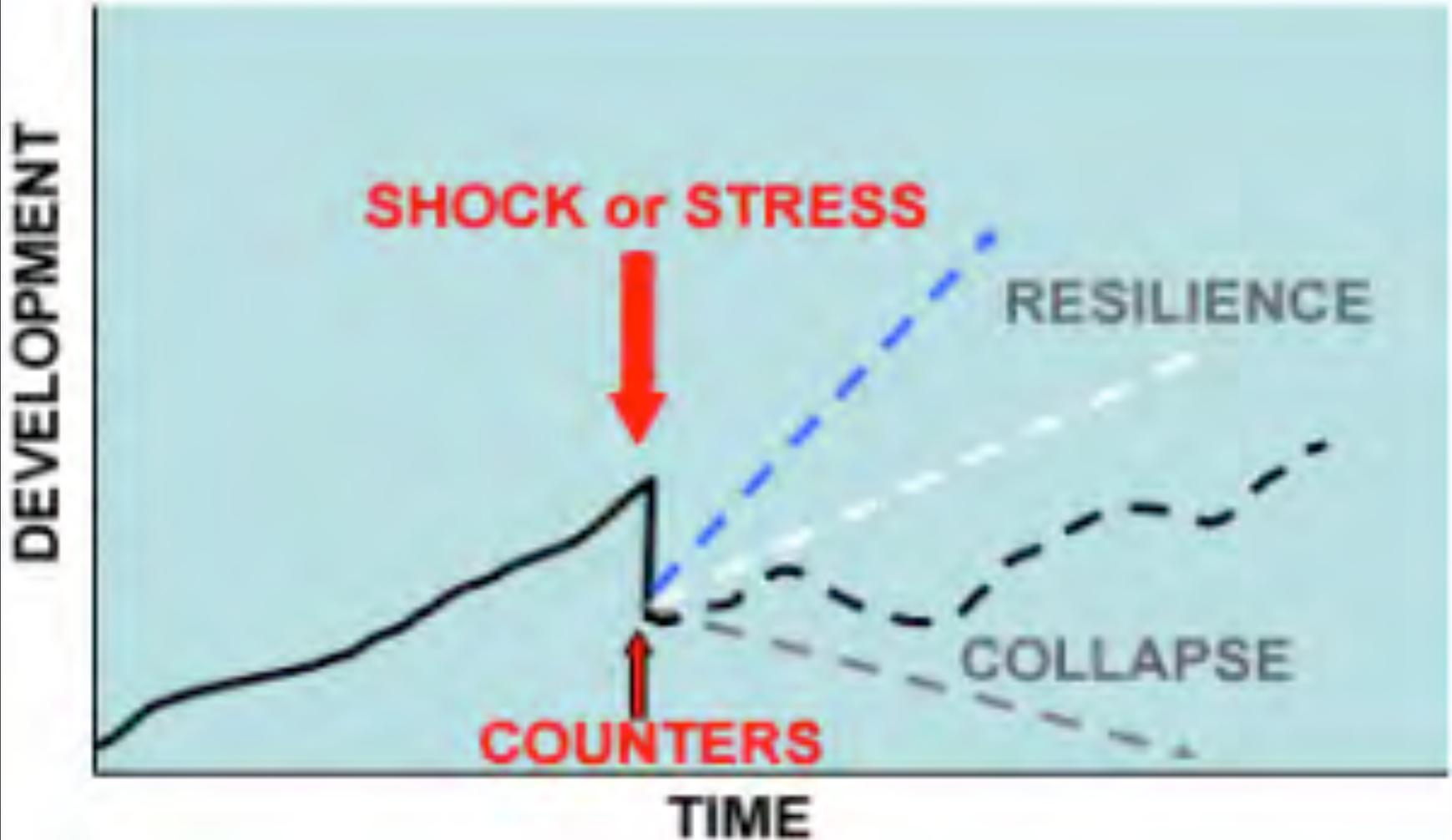
Integrating
Sustainability & STEM

Fred D. Carter

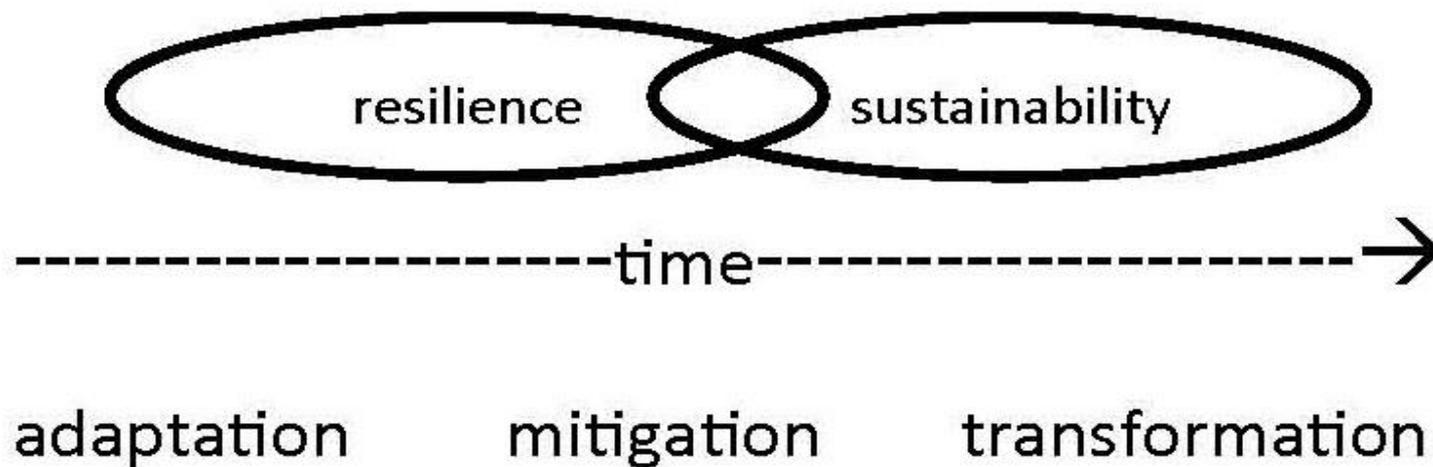
Exec. Director. Black Oaks Center

21st Century Community
Learning Center Spring Conference
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Resiliency



Operating Practices of Resilient Processes



Resilience

**Renewable
Energy**

BOC

**Sustainable
Agriculture**

**Sustainable
Building**

Black Oaks Center

Skills Building Tracks

Renewable Energy

Projects

- **Energy House**
- **Energy Hog**
- **Biodiesel**
- **Photovoltaics**
- **Renewable Energy Careers**

STEM Applications

- **Physics, Engineering, Math**
- **Thermodynamics, math**
- **Chemistry, math**
- **Physics, chemistry**
- **Technology**



Renewable Energy Sustainability Themes

- **Fossil Fuel use is not sustainable, reserves should be kept for future generations**
- **The combustion of fossil fuels leads to increased CO₂ in the atmosphere which fosters climate disruptions**
- **Renewables are needed to reduce the use of fossil fuels and the CO₂ production**
- **We must reduce the amount of energy we use.**

Renewable Energy

Best Practices/Lessons Learned

- **Most humans are willing to conserve energy for the next-generation.**
- **Renewable energy cannot replace the current source of fossil fuel energy**
- **The use of renewable energy sources reduces our carbon foot print**

Renewable Energy Outcomes

- Over than 30 high school students were inspired to look at the possibility of becoming renewable energy engineers

Youth are inspired to practice conservation for the benefit of the planet, all life

Students who were afraid of science and math were open to learning real life applications

Sustainable Agriculture

Projects

- School Garden Charette
- High Tunnel
- Seedling Cups
- Hatching Eggs

- Healthy Food Hub

STEM Application

- Biology, engineering
- Physics, Geometry
- Biology
- Biology, Embryology
- Math, Science Concepts (density)



Sustainable Agriculture Sustainability Themes

**To feed 7 plus billion people on the planet,
we must develop ecological local food
systems that nurture the planet and
people.**

**Growing food using sustainable agriculture
techniques reduces carbon footprint.**



Sustainable Agriculture Best Practices/Lessons Learned

10 to 1 or less is the best learning ratio in experiential, hands on learning projects in the garden, working with tools.

Walking through how to do first and then with leads to a better skills transfer.



Sustainable Agriculture Outcomes

- **Children started eating healthier foods**
- **Some children consider farming and agriculture as a career.**
- **The children learn how mathematics & science lives inside of food/food systems**



Sustainable Building

Projects

- Building high tunnel
- Building raised beds
- Earthen wall at black Oaks center

Stem Application

- Physics, math
- Physics, math
- Physics, Chemistry

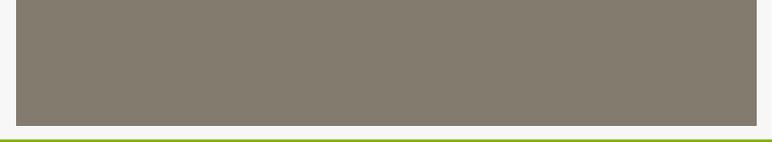


Sustainable Building Sustainability Themes

Energy efficiency, ability of a enclosed structure to keep heat in or out is on of the major things we can do to reduce to reduce our heating and cooling bills while reducing our carbon footprint

Natural building materials can be safe, healthy and affordable.





Sustainable Building Best Practices/Lessons Learned

Children loved learning to build!

**Great way to introduce geometry, physics
chemistry and math.**

Tactile learners in their element



Sustainable Building Outcomes

One of our youth has gone on to do earth building in Ghana

We have a straw bale building many people have had 1st time opportunity to learn about sustainable building.

Resilience

Projects

Community Charrette

The Silent Walk

The Forest Garden

STEM Application

Ecology, Engineering
Design

Science Concepts,
Observation

Ecology, Biology:
Symbiosis





Resilience

Best Practices/Lessons Learned

The concept of “designing” space and living is very empowering and uplifting for children.

The process gives them a sense of ownership and motivation to see their visions through.



Resilience Sustainability Themes

- Everything and everyone is connected. We are not separate from each other. We all are in relationship with one another**
- In our relationship we are an integral part of an ecosystem, not outside of it.**
- It is important to honor these relationships in all that you do, collective sharing of resources.**

Resilience Outcomes

Children and young adults are inspired to take on leadership inside of the energy and resource constraints that they are inheriting.

Leadership applying sustainable principals for resilience.

