**Tags**
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# Day 2: Friday 8.20.21

Plan for today:
1. Overview, review chapter 1: FR (links below)
2. Big picture project-your goals
3. iPads, Froggie book (time permitting)

First, some clarity:
This is "the frog book" only available now on the iPads:


This is another text we'll be using, Friedland and Relyea, 3rd edition (note THIRD edition):


Here's a link to chapter one, so you can do the homework over the weekend
You might notice that the FR text is more detailed. The first two chapters of both this and the frog book (iBook) deal with defining environmental science, the scientific process and how APES covers many different topics.

The FR text is divided into modules, with practice questions (PQ) at the end of each section and chapter questions (CP) at the end of each chapter. Your homework will often be the PQ during the week, and the larger CP over the weekend.

These notes are all about context, what you can't get just from the textbook...

**FR Module 1 ----------**

Fracking-What is it? Why is it controversial? How has it changed how we generate electricity in our country? At what cost? Why is this politically important? Why are the solvents they use secret? What is the impact of these solvents on water? Who developed it around 1960? What did he later put all of his money into?

Bio=life, so **biotic** means living, **abiotic** means not living (druids had a neat view on this)

How systems are defined enables us to create models of cause and effect (favorite topic of physicists and historians as well)

**FR Module 2 ----------**

Environmental indicators: what we know and can observe that indicate the condition of

a system

Ecosystem services: can be economic, direct or cascading (off shore oil for example, impacting fishing in the gulf of Mexico)

**TABLE 2.1** Some common environmental indicators

| Environmental indicator | Unit of measure | Chapter |
|---|---|---|
| Human population | Individuals | 7 |
| Ecological footprint | Hectares of land | 1 |
| Total food production | Metric tons of grain | 11 |
| Food production per unit area | Kilograms of grain per hectare of land | 11 |
| Per capita food production | Kilograms of grain per person | 11 |
| Carbon dioxide | Concentration in air (parts per million) | 19 |
| Average global surface temperature | Degrees centigrade | 19 |
| Sea level change | Millimeters | 19 |
| Annual precipitation | Millimeters | 4 |
| Species diversity | Number of species | 5, 18 |
| Fish consumption advisories | Present or absent; number of fish allowed per week | 17 |
| Water quality (toxic chemicals) | Concentration | 14 |
| Water quality (conventional pollutants) | Concentration; presence or absence of bacteria | 14 |
| Deposition rates of atmospheric compounds | Milligrams per square meter per year | 15 |
| Fish catch or harvest | Kilograms of fish per year or weight of fish per effort extended | 11 |
| Extinction rate | Number of species per year | 5 |
| Habitat loss rate | Hectares of land cleared or "lost" per year | 18 |
| Infant mortality rate | Number of deaths of infants under age 1 per 1,000 live births | 7 |
| Life expectancy | Average number of years an infant born today can be expected to live under current conditions | 7 |

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Biodiversity is a key indicator (why?)

**TABLE 2.2** Five key global indicators

| Indicator | Recent trend | Outlook for the future | Overall impact on environmental quality |
|---|---|---|---|
| Biological diversity | Large number of extinctions, extinction rate increasing | Extinctions will continue | Negative |
| Food production | Per capita production possibly leveling off | Unclear | May affect the number of people Earth can support |
| Average global surface temperature and $CO_2$ concentration | $CO_2$ concentrations and temperatures increasing | Probably will continue to increase, at least in the short term | Effects are uncertain and varied but probably detrimental |
| Human population | Still increasing, but growth rate slowing | Population leveling off; resource consumption rates also a factor | Negative |
| Resource depletion | Many resources being depleted at rapid rate, but human ingenuity develops "new" resources, and efficiency of resource use is increasing in many cases | Unknown | Increased use of most resources has negative effects |

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These are the 5 challenges that you will deal with in this century. Knowing about them will enable you to impact change.

It's all about you...

**More terms:**

Genetic diversity: variation in a population (could be age distribution in our **class**)

Species: different in obvious ways (definitions vary on this)

Species diversity: variation of species in a habitat (age distribution in the **school** or elab)

Speciation: an adaptation based on **stress**

Evolution needs three things:

1. some form of genetic variation
2. some **stress** that favors this variation
3. survivors have to reproduce and carry on the variation

Think of giraffes as an example:

1. longer necks in some animals
2. drought that kills all short neck creatures (just like in "land before time")
3. long neck animals survive to reproduce and carry on the variation

There is an interesting theory that the background rate of mutation/speciation was much higher long ago because our atmosphere was thinner, and enabled more cosmic rays to penetrate, causing much higher rates of mutation/speciation.

**Cool stuff:**

In England, butterflies have adapted since 1850 to look more like soot from coal fires.
In NYC, a species of "subway mosquitoes" have been found that feed on humans in a dark, cool place
Huh.

**Extinction** is the opposite of speciation, where species die off.
There is such a thing as a "background rate of extinction", which we have surpassed by many times

Diversity is good: think of monoculture food crops: one pest kills everything.

Food production: see Malthus and Norman Borlaug, e.g. Mexico famine (APHG?)

Anthopogenic (anthro=man, genic=cause) Climate change:
Greenhouse gases (see car windshield as an example)
Not too many people know we need some CO2 on our planet to keep water above freezing-think of this as we search for exoplanets...

Resource depletion is hard to grasp, but resource constraints are easier:
If we had a major tsunami here that closed airports (all near the shore) and ports, how long would we have:

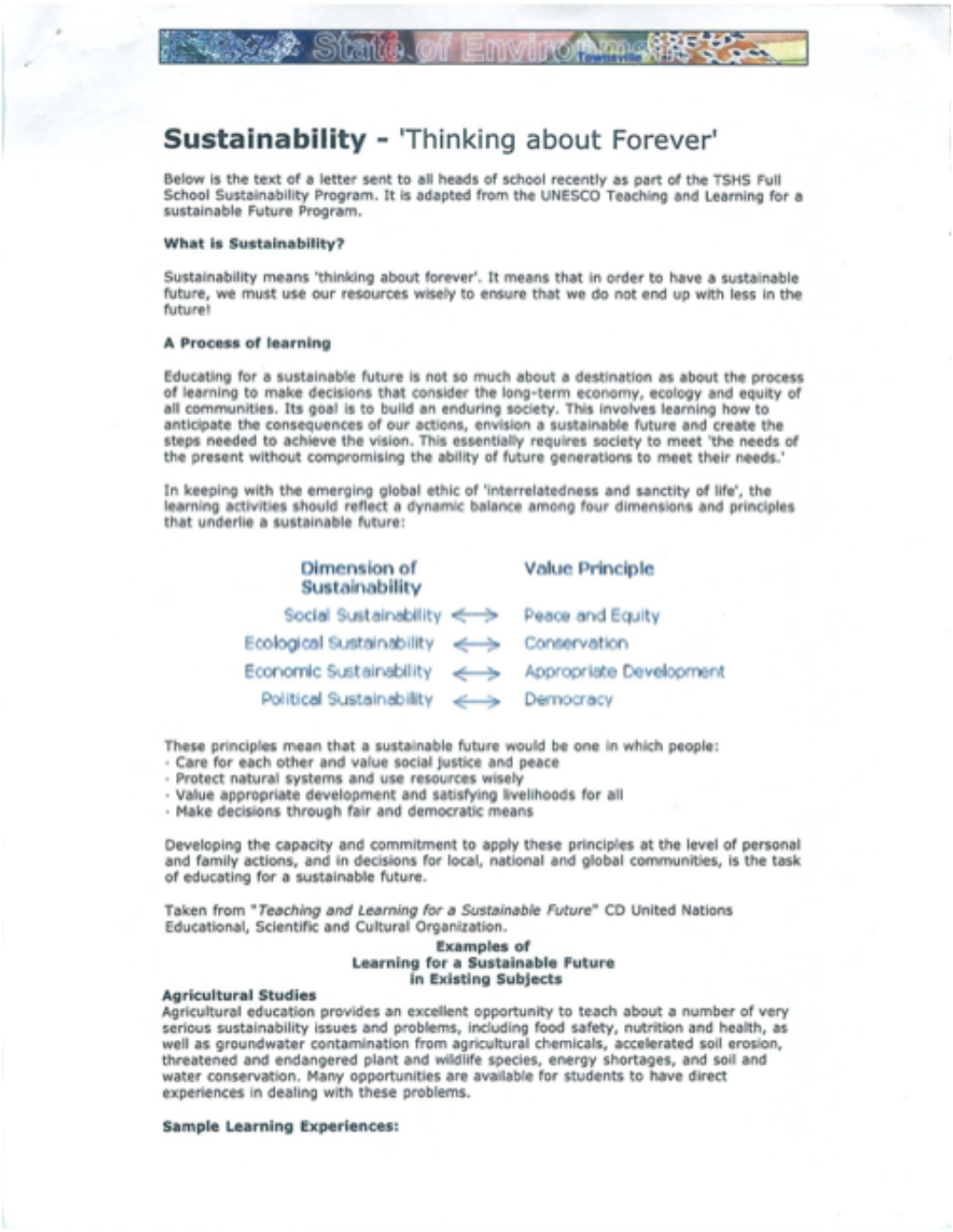
- electricity?
- water? (pumped by electricity)
- food?

**Our key concept:**
energy->water->food->culture

1. With energy you can move/purify water
2. With water you can grow food
3. With food you can maintain a culture

Global Footprint countries

Sustainability: Thinking of forever



State of Environment Townsville

## Sustainability - 'Thinking about Forever'

Below is the text of a letter sent to all heads of school recently as part of the TSHS Full School Sustainability Program. It is adapted from the UNESCO Teaching and Learning for a sustainable Future Program.

**What is Sustainability?**

Sustainability means 'thinking about forever'. It means that in order to have a sustainable future, we must use our resources wisely to ensure that we do not end up with less in the future!

**A Process of learning**

Educating for a sustainable future is not so much about a destination as about the process of learning to make decisions that consider the long-term economy, ecology and equity of all communities. Its goal is to build an enduring society. This involves learning how to anticipate the consequences of our actions, envision a sustainable future and create the steps needed to achieve the vision. This essentially requires society to meet 'the needs of the present without compromising the ability of future generations to meet their needs.'

In keeping with the emerging global ethic of 'interrelatedness and sanctity of life', the learning activities should reflect a dynamic balance among four dimensions and principles that underlie a sustainable future:

| Dimension of Sustainability | | Value Principle |
|---|---|---|
| Social Sustainability | ⟷ | Peace and Equity |
| Ecological Sustainability | ⟷ | Conservation |
| Economic Sustainability | ⟷ | Appropriate Development |
| Political Sustainability | ⟷ | Democracy |

These principles mean that a sustainable future would be one in which people:
- Care for each other and value social justice and peace
- Protect natural systems and use resources wisely
- Value appropriate development and satisfying livelihoods for all
- Make decisions through fair and democratic means

Developing the capacity and commitment to apply these principles at the level of personal and family actions, and in decisions for local, national and global communities, is the task of educating for a sustainable future.

Taken from "*Teaching and Learning for a Sustainable Future*" CD United Nations Educational, Scientific and Cultural Organization.

**Examples of**
**Learning for a Sustainable Future**
**in Existing Subjects**

**Agricultural Studies**
Agricultural education provides an excellent opportunity to teach about a number of very serious sustainability issues and problems, including food safety, nutrition and health, as well as groundwater contamination from agricultural chemicals, accelerated soil erosion, threatened and endangered plant and wildlife species, energy shortages, and soil and water conservation. Many opportunities are available for students to have direct experiences in dealing with these problems.

**Sample Learning Experiences:**

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Notice that these are not your usual "energy, food and water" items people think about.
Sustainability is living within your means.
Starbucks example...

Ecological footprint: created by Jurgen Randers and Mathis Wackernagel (both here for the opening of this famed structure)

1. energy

1. energy
2. settlements
3. timber
4. food
5. seafood
6. carbon
7. built up land
8. forests
9. cropland
10. fisheries

What impacts your global footprint?

**Weekend Homework, Due Wednesday (yay!) 8.25.21:**
Read modules 1-3, complete the practice questions at the end of each module, email your answers.

**Cause and effect, email your answers:**

Why does the girl think her dad is an alien?

https://www.youtube.com/watch?v=sVRAtQ7XjkM

What don't we see between the kiss and him driving home?

https://www.youtube.com/watch?v=g7_slK24lXU

Monty Python Witch scene:

https://www.youtube.com/watch?v=Ii68tPIiZOo

1. Can you follow cause and effect?
2. What is their logical path?
3. Why do folks associate fracking with earthquakes? (chapter one in the text)
4. Why do folks associate fossil fuels with global heating?
5. Who might be against this line of reasoning and why?