Learning Objectives

Water

Foundational Knowledge

Key information:

1.1 | Understand that water is both available and contaminated through the hydrological cycle.

1.2 | Understand the difference between consumptive and non-consumptive water use.

1.3 | Identify the major physical, chemical and biological constituents found in raw or natural water (natural organic matter, synthetic organic matter, pathogens, and inorganic particles).

1.4 | The purpose of water treatment processes is to remove particulate matter and pathogens.

Key ideas or concepts:

1.5 | Major consumption and pollution of water occurs through economic activities of the industrial-era.

1.6 | Water quality and availability is linked to the local, regional and global systemic conditions caused by the economic activities of the industrial-era.

1.7 | Water is a limited natural resource that is not distributed equally in the world.

1.8 | Water and embodied energy are intrinsically linked.

1.9 | Water is embodied in all materials, products, and services.

1.10 | The quantity of embodied water can be estimated through a method called Water Footprint, which is a metric that is inherently limited, like all quantification methods.

1.11 | Government water quality standards are established in the U.S. without a complete knowledge of how contaminants' affect living beings, through balancing health risks with public cost of water treatment.

Application

Critical thinking:

2.1 | Evaluate issues of water scarcity, stress, and conflict on the global population and their potential effect to human well-being.

Creative thinking:

2.2 | Be able to conceptualize alternative ways to meet the water demand with consideration of local resources, cultural conditions, and economic constraints.

Practical thinking:

2.3 | Describe functional requirements of a treatment processes to improve water sources that is appropriate for different given situations.

Skills:

2.4 | Use the causal loop diagram to depict the interaction between water quantity, use, pollution, quality, and energy.

2.5 | Use the causal loop diagram to depict relationships between population, consumption, technology, and water scarcity and demand.

2.6 | Use the water footprint method to consider the implications of different manufacturing and agricultural activities in a particular area.

Integration

3.1 | Understand that engineering design decisions can have both positive and negative global impacts through stressors on water, energy and ecosystems.

3.2 | Articulate how you, as an engineer, can help achieve more equitable distribution of water resources in your community and around the world.

3.3 | Understand the segments of existing and future populations that are at a greater risk of water stress and demand due to environmental, social, cultural, political, and economic issues and pressures.

3.4 | Explain how the engineer's creed relates to the wider global community goals, such as the United Nationals Millenium Development Goals.

Human Dimension

4.1 | Understand that your daily actions affect the local, regional, and global well-being of others.

Caring

5.1 | Value water as a precious resource.

5.2 | Care about all equally serving all human welfare through global water resources and sanitation.

5.3 | Feel that you, as an engineer, can help achieve more sustainable management of water resources in your region and globally through your own decisions and actions.

Learning How to Learn

6.1 | Recognize the limits of one's knowledge around water issues.

6.2 | Formulate questions that would need to be answered to address an issue involving water.

6.3 | Design and execute a plan for self-directed learning.

> **What impact do I want this module experience to have on students, which will still be there a year or more after the course is over?**

Learning Objectives

Fink Taxonomy of Significant Learning

Integration (3)

What connections (similarities and interactions) should students recognize and make...

- *Among ideas within this course?*
- *Between the information, ideas, and perspectives in this course and those in other courses or areas?*
- *Between material in this course and the students' own personal, social, and work life?*

Application (2)

What kinds of thinking are important for students to learn here:

Critical thinking, in which students analyze and evaluate?
Creative thinking, in which students imagine and create?
Practical thinking, in which students solve problems and make decisions?

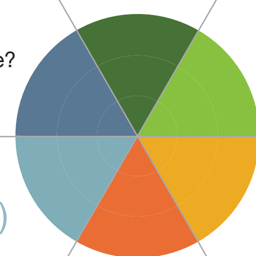
What important skills do students need to learn?

What complex projects do students need to learn how to manage?

Human Dimension (4)

What can or should students learn about themselves?

What can or should students learn about understanding and interacting with others?



Foundational Knowlege (1)

What key information (facts, terms, formula, concepts, relations...) is important for students to understand and remember in the future?

What key ideas or perspectives are important for students to understand in this module?

Caring (5)

What changes would you like to see, in what students care about, that is, any changes in their...

- *Feelings?*
- *Interests?*
- *Values?*

Learning How to Learn (6)

What would you like for students to learn about...

- *How to be a good student in a course like this?*
- *How to engage in inquiry and construct knowledge with this subject matter?*
- *How to become a self-directing learner relative to this subject? That is, having a learning agenda of what else they need and want to learn and a plan for learning it.*

What impact do I want this module experience to have on students, that will still be there a year or more after the course is over?