Learning Activity 1 A | **Materials**

Understanding the global picture of material resources as related to the United Nations' Millennium Development Goals.

Targeted Learning Objectives

1.2 Natural and artificial materials have fundamentally different life cycle behaviors.

1.3 Material resources are finite in our closed thermodynamic system of earth.

2.7 Use Meadow's hierarchy of systems interventions to identify high-leveraged opportunities to lower the impact of a design.

3.1 Realize that using materials in products implies the entire life cycle activities that includes resource use and waste outputs at each stage.

3.2 Formulate questions about the local, regional and global implications of each step in a material's life cycle; (i.e. civil war, conflict, loss of biodiversity, etc.)

3.3 Realize that material use can have societal implications ranging from new economies to civil war, conflict, social inequity, depending on the design choices in the life cycle.

3.4 Realize that materials use can have environmental implications ranging from ecosystem recovery to biodiversity loss and pollution, depending on the design choices in the life cycle.

4.1 Understand that the personal and professional decisions we make regarding the materials we use have a profound impact on ourselves and the environment.

4.2 Be able to articulate their interpretation of the meaning of the engineer's creed with respect to the implications of their personal and professional choices.

5.1 Develop an interest in using one's engineering understanding to create sustainable alternatives to industrial-era products and processes.

5.2 Feel empowered by understanding to innovate sustainable alternatives to industrial-era products and processes.

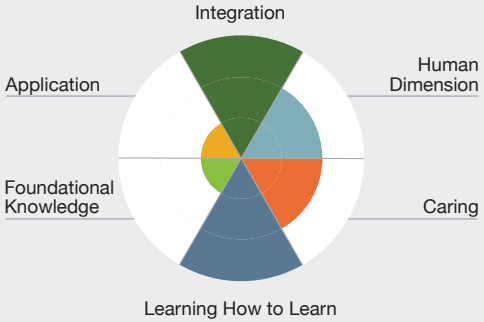
6.1 Formulate questions about broader societal implications of materials in designs.

6.2 Practice the virtues of critical thinking when evaluating new information: ***1.*** Intellectual integrity, ***2.*** Intellectual humility, ***3.*** Confidence in Reason, ***4.*** Intellectual Perseverance, ***5.*** Fairmindedness, ***6.*** Intellectual Courage, ***7.*** Intellectual Empathy, ***8.*** Intellectual Autonomy

Active Learning Profile
information source: direct / indirect
experience: doing / observing
reflection: individual / group

Time Investment Profile
group: 20-30 minutes discussion

Development Profile



Notes to Faculty

The goal is to have students think about the Millennium Development Goals, their reason for being developed, various population and sustainability issues, and the engineer's role in reaching these goals. Taking the time to research the MDG's and understand how they relate to an increasing global population will allow the students to care about the world around them. It is likely that the research needs to be done individually, however, working in a group on the questions enables them to practices the virtues of critical thinking.

There are no correct answers. It is hoped that the activity aids in the development of systems thinking.

- Jane Qiong Zhang and Linda Vanasupa

Learning Activity 1 A | **Materials**

Understanding the global picture of material resources as related to the United Nations' Millennium Development Goals.

Activity

Using the United Nations' Millennium Development Goals website (http://www.un.org/millenniumgoals/) and other resources, research the following questions and ideas and discuss them in the form of a five-page report: **1** | Give an overview of the background and reasoning for the development of the MDG's, and give a brief synopsis of each MDG. **2** | Discuss the amount of investment, natural resources, and human capital needed to meet all of the MDG's. Make sure to include a section about the "Target" concerning urban slums (i.e. the percent of the global population living in slums). **3** | Explain how the MDG's provide opportunities for discipline-specific innovation. Or, how does your discipline fit into each of the individual Millennium Development Goals? Please expand further on the four "Targets" relating to "Goal 7: Ensure Environmental Sustainability".

Objectives	**Criterion**	**Standards**
6.2	Learning how to learn	5 PROFICIENT Practices the five virtues of critical thinking with openness and respect for others' point of view. 3-4 DEVELOPING Practices less than all five of critical thinking or inconsistently practices them. 0-2 BELLOW EXPECTATIONS States own viewpoints as facts, creates an unwelcome atmosphere for those with differing viewpoints.

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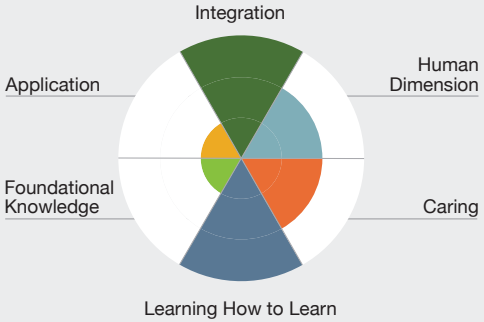

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