

Lesson #20: Project Take-Make-Waste → WASTE Report

Stage 1 – Desired Results	
Established Goals: GLO B: Explore problems and issues that demonstrate interdependence among science, technology, society and the environment	
GLO C: Demonstrate appropriate inquiry, problem-solving and decision-making skills and attitudes for exploring scientific and/or technological issues and problems	
Understandings: Students will understand that...1. Science-based decision-making models such as The Natural Step's 4 sustainability guidelines can be used to help make decisions about how to TAKE-MAKE-WASTE more sustainably. 2. Science is a useful and essential tool in addressing sustainability	Essential Questions: SLO C3: How can the Natural Step's 4 sustainability guidelines be used to help in decision-making about how to TAKE-MAKE-WASTE more sustainably?
Students will know... 1. SLO B3: Identify factors that affect health and explain the relationships of personal habits, lifestyle choices, and human health (individual/social) 2. How to apply the 4 guiding ideas to their organization	Students will be able to... SLO C5: Work cooperatively with others and value their ideas and contributions SLO B5: Identify and demonstrate actions that promote a sustainable environment, society and economy (locally/globally)
Stage 2- Assessment Evidence	
Knowledge: 1. SLO B3: Identify factors that affect health and explain the relationships of personal habits, lifestyle choices, and human health (individual/social) 2. How to apply the 4 guiding ideas to their organization. 3. A great deal about the science behind their individual products.	Skills: Assess ability to work cooperatively (Groupwork Evaluation) Assess Decision-Making Process (Appendix 9 (p.54&55))
Materials Required	
Powerpoint: Project TAKE-MAKE-WASTE (you may want to re-word the 4 system conditions according to the wording that your class understands/prefers) (you may want to re-word the 4 system conditions according to the wording that your class understands/prefers) HANDOUT: Notes from the Packaging Laboratory:Polylactic Acid – An Exciting New Packaging Material. (Source: Balkcom, M., Welt, B., & Berger, K. (n.d.). Notes from the Packaging Laboratory:Polylactic Acid – An Exciting New Packaging Material: University of Florida. Retrieved on August 30, 2007 from http://edis.ifas.ufl.edu/AE210 (Powerpoint available at http://ecow.engr.wisc.edu/cgi-bin/get/che/562/connection/week8-just/polylacticacid.ppt#256,1,Polylactic Acid) DVD: Captain W Productions. (n.d.). Ecology of Commerce. Schumacher College: Dartington Totnes Devon, UK: Captain W Productions (Title 2: Paul Hawken Ecology of Commerce and Title 4: Sachs – 11 th Stop)	
Stage 3 – Learning Plan	
<ol style="list-style-type: none"> 1. Slide 15 – RECORD students' perceptions of what humans' mental model for waste is 2. Slide 16 – Discuss the potential violations of Robert's guiding idea #4 posed by the Mexico garbage dump example. 3. Slide 17 – Remind students of First Law of Thermodynamics 4. Slides 18-22 – Review the closed-loop nature of the water cycle, nitrogen cycle and the carbon cycle 5. Slides 23 – 29 Discuss the example of water hyacinths and the need for substitution. This in turn is a need for science as we try to discover options for substitutions. Reflect on how this might apply to students' businesses. The need to make their production a closed loop is one that will take some creativity and research. 6. Slides 30 & 31 – Students should finish their WASTE reports. Before they do, introduce HANDOUT: Notes from the Packaging Laboratory: Polyactic Acid – An Exciting New Packaging Material. After students have read it, they may feel that this is 	

the answer to all the problems with plastics (and indeed it might be an improvement). However, it is important to think critically so that we can have foresight before jumping in to the PLA “wave” if you please. Have them discuss using “corn” as a supply for plastics. The article describes that plastic will originate from a renewable resource but how will its demand for corn compete with demand for food? Use of agricultural land? Expansion on agricultural land? What does the future hold if we use “food” for fuel (ie biofuels) and “food” for plastics? Where will “food” come from? If food is limited, who will get it? Is there a different type of solution? A non-technological solution?

5. SHOW students **DVD:** Captain W Productions. (n.d.). Ecology of Commerce. Schumacher College: Dartington Totnes Devon, UK: Captain W Productions (Title 2: Paul Hawken Ecology of Commerce and Title 4: Sachs – 11th Stop. The first clip (31:30 – 37:17) focuses on WHY Karl-Henrik Robert started The Natural Step in the first place (It was because he saw a discrepancy in what people said and what they did). The second clip deals with a questions about our mental models about material goods. Debrief.

6. Invite Guest Speakers as needed (Tiber River)(see Longer Term Planning) to show students how more sustainable products are made and what the motivations are of the people who make them (other than to make \$ that is).

Extension Learning Activities

Details for Visual on Slide #22

Source: Arthus-Bertrand, Y. (2001). Earth From Above, 365 Days. New York: Harry N. Abrams, Inc.

“Mexico. Garbage dump in Mexico City.

Mexico City is the most polluted capital in the world owing to its heavy industrial emissions, and also has to deal with almost 20,000 tonnes (22, 000 tons) of household garbage produced every day by its 16 million inhabitants. Only half of this garbage is incinerated; the rest is heaped onto open-air garbage dumps that are visited by the most destitute members of society looking for what they can salvage. Household waste is piling up on every continent, and is one of the major problems of large urban centers; however it is in the industrialized countries that people throw away the largest quantities of garbage: from 300 to 870 kilograms (650 to 1,900 pounds) per inhabitant per year, as opposed to 100 kilograms (220 pounds) in the majority of developing countries. Nowadays, industrial recycling techniques are used more and more to solve the problems associated with the accumulation of waste.” (Arthus-Bertrand, 2001, p. June 30)

Ecology of Commerce

(DVD: Captain W Productions (n.d.). Ecology of Commerce. Schumacher College: Dartington Totnes Devon, UK: Captain W Productions)

Title 2: Paul Hawken – The Ecology of Commerce 31:30 – 37:17 (or 41:27)

Notes:

1. Between 37:17 – 41:27 there is a reference to “God” – as part of a story told to Hawken about a teacher who told her students to draw something that they loved. The student named “Mary” replies that she will draw God, to which the teacher replies that we do not know what God looks like. “Mary” replies that we will once she draws her picture.

Suggested Questions:

1. Who started TNS?
2. WHY was it started?
3. What does Hawken mean when he says “ The richer we get, the poorer we get”?

Title 4: Sachs – 11th Stop (2-3 minutes long)

New vocabulary: affluence

Suggested Questions:

1. Can you think of other examples of the following:
 - a) Our understanding of “ the good life”
 - b) We have been “rich” in objects and “poor” in time
 - c) All goods are “thieves of time”
 - d) “Limit your material satisfaction to maximize your internal satisfaction”

How to Complete the WASTE Report

In your business profile, you indicated the average time that the consumer uses your product. You must now indicate what is done with your product once it is deemed as “useless” by the consumer.

WASTE Report

Summary Chart

Source of 4 guiding ideas: Robèrt, K. (2002). *The natural step story: seeding a quiet revolution*. British Columbia: New Society Press.

The Natural Step Four Guiding Ideas for Decision-Making Does your organization...	Description of violation	List creative options	List + and – impacts of each one	Identify plan you choose (consensus)	Action Plan	Implement Evaluate	Communicate results Reassess the results
1. ...TAKE substances from the Earth's crust. (metals, petroleum) at a rate that it is too high for nature to put the substance back into the earth's crust?							

<p>2. ...MAKE synthetic substances that cannot be degraded or recycled by nature (ie they are persistent or unnatural) at a rate that it is too high for nature to deal with the substance?</p>							
<p>3. ...physically degrade nature by taking too much (over-harvesting), introducing species to where they are foreign or participate in other forms of modification that nature cannot deal with?</p>							

<p>4. ...try to ensure that human needs are met in our society and worldwide do that everyone can meet their needs worldwide, now and in the future? (over and above just stopping the damage it is presently doing, using resources fairly, efficiently?)</p>								
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1. What is the most difficult part of decision-making?
 2. What is the role of science in your decision-making?
 - *is science needed? A little?A lot?
 - *does science help or hinder (or both) when making these decisions?
 3. DESCRIBE 1-3 main reasons that your business changed what it did?
 4. Did your mental model about how humans take-make-and-waste change from when you were making your organization profile? If so, how? If not, why? Be sure to record any changes on the form
- Changes in Your Organization Profile

