Lesson Author: Brian Bluhm
Lesson Topic: UMD Rain Garden/Storm Water
Grade level: College-aged students
Length of lesson: 50 minutes

Stage 1 – Desired Results

Content Standard(s):
- Campus Learning Goals: Knowledge (acquisition, integration and construction); Thinking (critical thinking and systems thinking); and Social Responsibility (global perspective and civic engagement) (http://www.d.umn.edu/vcaa/assessment/documents/InstGoals_Outcomes.pdf)
- UMD Strategic Plan Goal 6 (Enhance UMD’s infrastructure; technologies; and information, and human resources to support the campus in a sustainable manner), specifically Action Step 9 (Infuse the concept and application of sustainability into our curriculum and co-curriculum, our research activities, and our use of facilities) (http://www.d.umn.edu/chancellor/planning/action.html)

Enduring Understandings (Big ideas communicated succinctly)
- Gain an understanding of sustainability efforts at UMD through the lens of water.
- Become aware of the interconnections and interaction between the economy, the society and the environment.
- Grasp why sustainability is important in peoples’ lives.

Essential Questions (Lead with ECS)
A. Why is clean water important to your life in Duluth?
B. How does the concept of sustainability relate to the concepts you’ve been discussing in your class and to our water?
C. How will sustainability play a role in your life (career and personal life)?

Student objectives/learning outcomes (Scaffold these in increasingly complex order based upon Bloom hyperlink here)
Students will:
I. Recognize that storm water is the number one cause of water quality impairments.
II. Give examples of storm water best management practices on the UMD campus.
III. Extend their understanding of storm water issues on the UMD Campus to the broader community and their experiences.

Stage 2 – Assessment Evidence

Performance Tasks (Real life assessments of this learning in the students’ worlds)
- Students will describe their

Other Evidence (Supportive details)
- Students participate in the conversation.
- Students take notes.
experience with the June 2012 flood.

- Students will communicate how storm water best management practices relate to sustainability, and how the concept of sustainability relates to their course to one another.

- Students ask thoughtful questions.

<table>
<thead>
<tr>
<th>Stage 3 – Learning Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Learning Activities</strong> <em>(Education Neuroscientific Learning Cycle: Sense luscious, Reflective, Analytical, Motor, and so on)</em></td>
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</tbody>
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1. **Materials & resources:** Sustainability circle prop, note cards for the number of students in the class and extras, pens for the number of students in the class and extras, image of clay run-off in Lake Superior

2. **Timeline:**
   - Classroom discussion: 10 minutes
   - Walk to the Rain Garden: 10 minutes
   - Tour of the Rain Garden: 20 minutes
   - Final Discussion: 10 minutes

3. **Introductory activities:** Distribute note cards and pens. Ask students to reflect on their experience with the June 2012 flood and display the image of run-off into Lake Superior. Describe that we will be learning about the storm water best management practices at UMD via touring the rain garden. Tell students sustainability is part of the UMD Strategic Plan. Ask students to relate how storm water management and sustainability on campus relates to their course objectives. Tell students that through the tour of the rain garden, they will learn about storm water management at UMD, and how storm water management is one of many sustainability initiatives at UMD. Give students a brief explanation of sustainability using the sustainability circle prop. Ask students to reflect on the essential questions.

4. **Developmental activities:**
   - Ask for students to communicate their thoughts about the flood, and how the flood relates to storm water management at UMD with the group. Ask students to paraphrase their thoughts from their note card.
   - Tell students to take their note cards and pens along for the tour, and to write down additional thoughts and questions during the tour.
   - Make sure the students are prepared for the weather, with comfortable walking attire.
   - Guide students from their classroom toward the rain garden, located along College Street.
   - Walk near a storm water drain stencils. Describe how storm water runs directly into Lake Superior without being treated.
• Describe storm water management strategies at UMD: alternative plantings, pervious surfaces, green roofs.
• Arrive at the rain garden. Split the group into smaller groups if needed.
• Tour the rain garden, using the Rain Garden Tour Guide (http://www.d.umn.edu/sustain/raingarden/selfguidedtour.pdf). Ensure that students are not facing towards the sun.

5. **Closing activities:**
   • Bring the group back together in a circle, in order to facilitate conversation.
   • Ask the students to look at their note cards and review the essential questions.
   • Ask the group to reflect on storm water management and sustainability at UMD (1. Why would UMD implement storm water management? 2. How does storm water management relate to sustainability? 3. How does sustainability relate to your course?)
   • Ask students to review their note cards (1. What notes did you take? 2. What additional questions do you have?).
   • Ask the instructor/professor to connect the tour with the course, and what they will be discussing next.
   • Let students know that if they are interested in learning more about sustainability initiatives at UMD, to check out the UMD Office of Sustainability website and Facebook page.
Connection to Educational Psychology

Stage 1

Enduring Understandings
- The enduring understandings define the big ideas that guide the lesson, without being too specific (Medina, 2008).

Essential Questions
- The essential questions help to focus the learning objectives. These questions are formed in a way that encourages student involvement in learning, while giving the instructor a base from which to create emotionally competent stimuli. ECS serves as a bridge between emotion, which is key to learning, and cognitive processes (Shiv, 2011). ECS will assist the learner to move the experience from short-term memory to long-term memory, encoding the memories with dopamine and moving them from the hippocampus to the pre-frontal cortex (Medina, 2008). In the lesson above, students are asked to connect their experience with the June 2012 Duluth flood, to their classroom experience, to stormwater and to sustainability. An image of the Duluth Harbor after the flood will be used to create a visual connection between the event and stormwater run-off for the students.

Stage 2

Assessment Evidence
- Assessment of learning should be done through identifying learning in multiple ways (multiple intelligences and emotional intelligence) and evidence tools (written, demonstrated) (Gardner, 2004; Goleman, 2006). The assessment evidence should be designed to be culturally inclusive, so that different learners’ experiences and learning styles are identified and validated. For example, learners’ can be assessed based on their written thoughts, discussion and/or through another creative method (Doidge, 2007).

Stage 3

Sense Luscious:
1. Making sure that students are comfortable during the tour (weather-appropriate attire and facing away from the sun) will help to reduce stress and meet the physiological and safety needs of the students (Zull, 2002; Immordino-Yang & Faeth, 2010; Maslow, 1943). Reducing stress also helps the thought process move from the amygdala to the frontal cortex, where learning takes place.
2. Students will be able to use multiple intelligences in the way they perceive and experience the rain garden, including spatial, bodily-kinesthetic, and naturalistic (Gardner, 2004). By walking around, students will be making BDNF, which will encourage oxygen follow to the brain and increased neural development (Medina, 2011). Also, walking to and around the rain garden will be a sense luscious experience for the students. The experience will create emotional competent stimuli (ECS) through memories. Students will make new connections with emotions, memories and interests. New memories will be encoded with dopamine, which will make the memories more easily accessible to the students.
later (Medina, 2008).

Reflective:
1. Through sharing with others, students will be using multiple intelligences and emotional intelligences (intra and interpersonal) (Gardner, 2004; Goleman, 2006). Students will have the opportunity to relate the material to their own lives and interests (“...useful and relevant intuitions that guide their thinking and decision-making”) (Immordino-Yang & Faeth, 2010).
2. As students are asked to relate storm water management and sustainability to their experiences with the June 2012 flood and their coursework, while also writing this information down, students will be engaging multiple intelligences. This experience will enhance the memory of students through emotion and building upon previous experience (Gardner, 2004; Goleman, 2006; Immordino-Yang & Faeth, 2010). Students also will be using peer instruction (questions and discussion) keeping them engaged in the material and reinforcing the concepts (Mazur, 2011).

Analytical:
1. The lecture will expose students to the big ideas, leaving them with the responsibility to discover the specifics and contextualize the information (Medina, 2008). Visuals will help students to access multiple intelligences (Gardner, 2004; Zull, 2002). Also, the short time period of the tour will help to keep students’ attention (Medina, 2008).
2. Students will be able to contextualize their understanding of the big ideas, through applying them to their own lives, memories and emotions (Immordino-Yang & Faeth, 2010; Medina, 2008). Once again, this will be a practice with emotional intelligence as well, as students discuss and share (Gardner, 2004; Goleman, 2006). Students will be using peer instruction again as well (Mazur, 2011), through sharing their thoughts and posing questions.

Motor:
1. The tour of the rain garden will provide the students with a concrete and sense luscious/visually-focused experience (Zull, 2002). Students will perceive the rain garden and storm water management with multiple intelligences: spatial, kinesthetic, interpersonal and naturalistic intelligences (Gardner, 2004). Listening to fellow students talk about their flood experiences will also provide the students with a context and an emotional connection to the subject (Immordino-Yang & Faeth, 2010). The experience will also create ECS, encoding the memory with dopamine (Medina, 2008). The students will be moving their bodies again as well, creating BDNF, which promotes cognitive function (Medina, 2011).
Additional Resources


