

Sustainability, Systems & Digital game-based Learning

By Nadia Roumie, December 2006

Side Bars:

1. Sustainability

- a. Sustainability is an approach to sustain life indefinitely, or live in a way that meets our present needs without compromising the needs of future generations. In order to achieve sustainability, we must consider all the consequences of our decisions: environmental, economic, and social.
- b. Learn more about sustainable development and education at:
 - i. **U.S. Environmental Protect Agency**, (www.epa.gov/sustainability/)
 - Basic information on the definition of sustainability, what the EPA is doing and what the average person can do to help.
 - ii. **U.N. Department of Economic and Social Affairs – Division for Sustainable Development**, (www.un.org/esa/sustdev/)
 - Information on sustainable development initiatives and major achievements and goals.
 - iii. **The Cloud Institute for Sustainable Development**, (www.sustainabilityed.org/)
 - Sustainability education tools, lesson plans, how to get involved and a sustainability game.
 - iv. **Sustainability Education Handbook**, (www.urbanoptions.org/SustainEdHandbook/index.htm)
 - Resource guide for teachers to help incorporate sustainability education into state standards.

2. Systems Learning

- a. In order to understand sustainability, we must first recognize that we live in a system made up of many different elements that work together to function as a whole. The elements in a system are organized and linked to each other, so that if one element is changed or removed, it will affect all other elements in the system. A diverse system is a stable system; the more diverse it is, the more redundancy it will have, which will in turn lessen the effect caused by the elimination of an element.

Sustainability, Systems & Digital game-based Learning

By Nadia Roumie, December 2006

3. Digital game-based learning
 - a. Digital game-based learning is a new and engaging way to teach young students.
 - b. Nine out of 10 children play video games for at least an hour a day.
 - c. The video game industry sales reach \$7 billion, and a very small part of this market is educational video games.
 - d. There is great potential to reach many children at a level that will interest them

Today, teachers often approach a subject by breaking it down into different parts, but too often teachers do not teach students about the systems that connect the parts and all of the systems themselves. As a result, students cannot learn one of the most fundamental principles of sustainability. Video games have the potential to model the earth's systems and portray the many repercussions of each decision we make at a pace that will allow students to learn

In the *nature@play* seminar, our main goals were to teach 2nd grade students about the ecosystems in East Central Indiana while, at the same time, keeping the game fun and strategic. Some of the ecological aspects of sustainability that each mini-game touches on are as follows:

Wetland Game

- ◆ Objective of the game is to connect the wetlands using rocks and digs, with the fewest number of digs as possible
- ◆ Although digging may connect the wetlands, it has negative effects as well, illustrating the fact that our actions affect multiple elements in a system
- ◆ Digging can kill microorganisms that live in the soil as well as the homes that other species have created in the soil

Forest Game

- ◆ Objective of the game is to create a diverse and healthy forest by removing invasive species and planting a balanced number of native species.
- ◆ Diversity is a key element of sustainability
- ◆ A diverse system is a stable system because it has more redundancy of elements and is therefore able to handle the elimination or alteration of elements without the system breaking down

Sustainability, Systems & Digital game-based Learning

By Nadia Roumie, December 2006

- ♦ Game provides the option of herbicide vs. an axe to remove invasive plants
- ♦ The detrimental effects of herbicide are shown by a change in soil color and the fact that nothing can be planted in that area for a number of turns

Prairie Game

- ♦ Objective of the game is to pull up all invasive plant species hidden in the environment
- ♦ Invasive species are a threat to diversity as they tend to enter an ecosystem and take over the area, crowding out native plant species
- ♦ Invasive species also create an inhabitable environment for animals and thus decreases the diversity of animal species as well.

All three games touch on management techniques and the costs and benefits of each technique.

In order to explore other aspects of sustainability, Navigating Nature could be expanded to include: (1) the systematic relationship between different ecosystems, (2) more ecosystems and plant communities, (3) home environments, and (4) explore economic and social aspects of sustainability. Additionally, expanding the target group to include more grade levels would allow for the exploration of more complex subtopics and relationships essential to the understanding of sustainability.

Though the directions this could be taken are very broad, it will be important to connect the game structure to learning objectives and developmental levels of the target groups. For more information on how this is being explored please check out the *nature@play* seminar page at: www.bsu.edu/vbc/sem_20062007_spring_hunt.html