



On the Move with the 3Es

Background:

What is Systems Thinking?

Systems Thinking is a fundamentally different approach to examining community and global issues. Traditional techniques focus on separating the individual pieces of what is being examined into neat little compartments or disciplines. Systems Thinking, in contrast, focuses on how the concept being studied interacts with the other parts of the system. This means that instead of isolating smaller and smaller parts of the system being studied, Systems Thinking works by expanding its view to take into account larger and larger numbers of interactions as an issue is being studied.

Systems Thinking requires thinking in terms of relationships, connectedness, and context. Thinking systemically also requires several shifts in perception, which lead in turn to different ways to organize society. Systems are integrated wholes whose properties cannot be reduced to those of smaller parts. Their "systemic" properties are properties of the whole, which are possessed by none of the parts.

Shifting focus from the parts to the whole implies shifting from analytical thinking to contextual thinking. Since explaining things in terms of their contexts means explaining them in terms of their environments, all Systems Thinking is environmental.

All systems develop and evolve. Therefore, understanding them requires understanding renewal, change, and transformation. In practice, this shift can result in shifting emphasis to how a student solves a problem rather than on whether or not he or she gets the "right" answer. In communities, it can mean that the process for making decisions is often as important as the decisions themselves.

When we draw maps of relationships, we discover that certain configurations of relationships appear again and again. We call these configurations patterns. Instead of focusing on what a system is made of, we study its patterns. This shift leads to discovering that understanding how a pattern works in one natural or social system helps us to understand other systems that manifest the same pattern.

What is Sustainability?

Sustainability is commonly defined as: "Meeting the needs of current generations without compromising the needs of future generations." In order to determine if something is sustainable, three elements must be considered: economics, environment, and social equity. These are known as the "three Es."

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- Economic pertains to money. Some examples include jobs, cost, and human hours.
- Environment pertains to the natural and built world. Some examples include air quality, water quality, and open space.
- Social equity pertains to people. Some examples include health care, safety, culture, art, and religion.

How Does Systems Thinking Relate to Sustainability?

It may seem that the terms dynamic systems and sustainability are opposites, nothing could be further from the truth. In reality, sustainability is not a product or endpoint that is achievable but a dynamic system or process. No society actually attains sustainability, new interaction of subsystems constantly change or modify the stability of the system. Within a community, the factors of sustainability (3Es) are constantly interacting with each other. These interactions require adjustments within the system so that it becomes more sustainable.

Goal: Students will examine how the 3Es of sustainability represent a dynamic system.

Objectives: Students will...

- Understand the concept of a dynamic system
- Develop a working understanding of the terms subsystems, components, and influence
- See how systems change over time
- Recognize how subsystems interact within systems
- Visualize the relationships between the 3Es of sustainability

Materials (for a class of 30):

- 5 balls of yarn (different colors)
- 3 different colored pads of Post-It notes
- 30 copies of Systems Thinking and Sustainability Student Sheet

Time Required: 1 – 45-60 minute class period

Standards Met: S2, S7, LA3, LA6, LA12, GM1, M2, DA1, R3

Procedure:

PREP:

Before class, prepare 30 Post-It notes (10 for each of the 3Es) with each note having one of the aspects of sustainability found in Table 1 of the Student Sheet written on it. Each of the 3Es should be on the same color of note.

IN CLASS

- Explain to the students that they are going to do an exercise to help them understand the dynamic nature of sustainability systems.
- Have each student look at Table 1 on their Student Sheet that lists aspects of sustainability grouped according to which E they represent.
- Explain any terms or concepts that the students might have questions about. **Note:** There may be some disagreement as to why certain aspects are listed under certain categories. This can open up an excellent

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discussion highlighting the idea that many aspects of sustainability overlap into more than one category.

- Pass out one Post-It note to each student in the room.
- Using the aspect of sustainability that was given to them, have each student pick two other aspects (one from each of the E categories different than theirs) that are related to their aspect in some manner and record them in Table 2 along with the relationship or influence that they have with the one they received.
- Have each student place their Post-It note on their back and then stand at their seat.
- When you give them the instruction, have the students move around the room looking for the 2 people who have the Es that they listed on their student sheet as having some influence or relation to the E on their back. It is very important that they do not give away which students are related to them, they should just keep a mental note as to who they are.
- After a few minutes, when everyone has found the two Es that relate to them, have them return to their assigned seat.
- Explain to the students that they are going to do an exercise that illustrates that sustainability is a dynamic, not static, system.
- Have the class move to a large open space (hallway, outside, cafeteria, etc.) or if that is not possible, have them move all the desks to one side or the middle of the classroom.
- Tell the students to form a large perimeter of students around the open space.
- When you say start, tell them that their task is to try to position themselves equal distance (Note: It is important to stress that this does not necessarily mean the midpoint) from the other two students that have the 2Es that they determined related to the E on their back. They are not allowed to say anything out loud or give any indication who these individuals are during the course of this exercise.
- Have the students begin moving and allow the exercise to continue for about a minute.
- After a minute has elapsed, have the students stop and again form a perimeter around the outside of the open space.
- Begin a discussion of the activity by asking the students the following questions:
 - Was the movement around the area always at a constant speed? Explain.
 - Did the outside limits of movement stay the same, did it collapse inward, or did it oscillate? Explain.
 - Did the group ever attain equilibrium (stop moving)? Why or why not?
 - What would happen if one or more students were removed from the group?
 - Do you think that an outside observer, not knowing what was happening, could describe the pattern of movement? Why or why not?
 - Is it possible to forecast the movement of the group or is the group self-regulating?
 - Could an outside person walk through the area without disrupting the movement of the entire group?

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- What term is used to describe the entire group of student in the room? (System)
- What term is used to describe the three people that were moving in relation to each other? (Subsystem)
- What term is used to describe each individual within the room? (Component)
- Where was your attention focused when you were doing this activity? Were you focused on the overall system or your subsystem? Were you focused on your own actions or the actions of others? Why is this perception important?
- What other systems can you think of that are interconnected, dynamic, and self-regulating? (e.g. the human body, an automobile, a natural habitat, etc.).
- Why and how is it helpful to understand these aspects of a system? How can this understanding of systems help us to figure out solutions to large and complicated global issues?
- How far-reaching are the effects of one small, intentional change within a system? What might the implications of this be for making positive changes to a system?
- What kinds of feedback helped us to fulfill the function of the activity (staying equidistant from 2 others)? Could we have done it with our eyes closed? (The ensuing discussion can address how not only visual perceptions, but also feedback of all kinds, guide us in our daily lives in the systems we co-create at home, work, and school).

Optional Activities:

- Before starting this activity, remove several students from the room. Have these students return during the movement phase of the activity, and have them try to explain the rules of the movement.
- Have these same students try to pass from one side of the room to the other without disrupting the interactions within the room.
- After the activity is over, and the students have returned to the perimeter of the room, randomly pass out the five balls of yarn to 5 different students.
- Starting with one student that has a ball of yarn, have them hang on to the end of the yarn and throw the ball to one of the Es that was part of their subsystem.
- Have the initial person then instruct the person that they threw the ball at to pull the string tight and hang on to it while they throw the ball to the third E of the original persons subsystem.
- Have the third person also pull the string tight, hang on to it, and toss the ball back to the original person.
- Have this subsystem put their string to the floor. It will probably form a triangle.
- Repeat this process, one at a time, with the other 4 balls of yarn until you have 5 triangles outlined on the floor.
- Discuss with the students what is illustrated by this activity.



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Name: _____ Date: _____

Table 1

Equity	Economics	Environment
Universal Health Care	Affordable Energy	Clean Potable Water
Free Public Education	Acceptable Standard of Living	Fresh Air
Democratic Principles	Free Trade	Renewable Energy
Religious Tolerance	Job Opportunities	Greenspace
Gender Equity	Technological Advances	Biodiversity
The United Nations (U.N.)	Taxes	Safety and Security
Mass Transit	Affordable Housing	Outdoor Recreational Opportunities
Access to Media	Adequate Food Production	Recycling
The Arts	Social Security	Farmlands
Global Perspective	Rest and Relaxation Time	Family and Friends

Table 2

My Assigned E	First Selected E	Second Selected E
How the Selected Es Influences My Assigned E		