SYSTEMS DESIGN IN A MAKER-CENTERED CURRICULUM

Melony Carey, Director of Secondary Education, Muskogee Public Schools
Donna Pillars, Principal, Ben Franklin STEM Academy, Muskogee Public Schools

THE MAKER MOVEMENT

Maker-Centered Learning: Empowering Young People to Shape their Worlds

Research by Harvard Project Zero

Edward P. Clapp

Jessica Ross

Jennifer Oxman Ryan

Shari Tishman

Agency by Design

http://www.agencybydesign.org/

MORE THAN JUST STEM EDUCATION

MPS Fab Lab @ Muskogee High School

STUDENT AGENCY - THE WHY

Empowering students to develop AGENCY

- STEM education as grit, perseverance, "I can do it", "I can follow my own path and make a difference, and I have a right and a say in my life."

Video: What is AbD

https://vimeo.com/136525046

SYSTEMS DESIGN – THE WHAT

What is Systems Thinking?

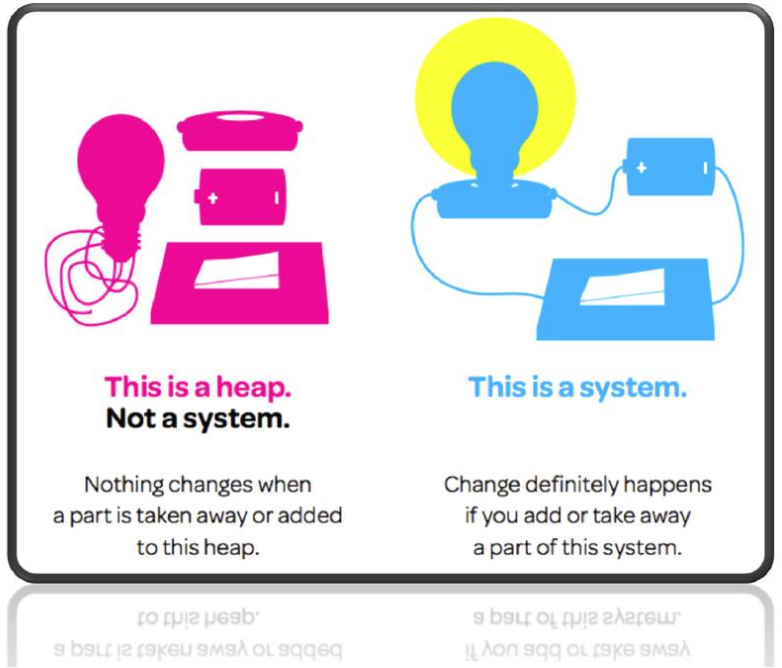
Systems thinking is the process of understanding how those things which may be regarded as systems influence one another within a complete entity, or larger system. In nature, systems thinking examples include ecosystems in which various elements such as air, water, movement, plants, and animals work together to survive or perish.

Developers: Forrester, Aronson, Senge, etc.

Sample Systems Definitions

- A system is a collection of parts that have some influence on one another and the whole.
- To be considered a system the components must interact or influence each other in some way.
- Systems have subsystems and may themselves be part of larger systems.

System/Heap Image



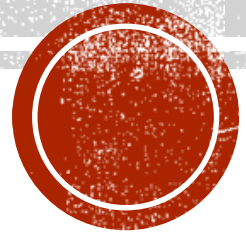
Why Use Systems Thinking?

- Enhances and develops habits of critical thinking
- Provides tools for expressing and communicating ideas effectively
- Supports the goals of the new OAS and STEM initiatives
- Fosters learner-centered learning and collaborative problem-solving
- Creates a framework for an interdisciplinary viewpoint
- Students do better when they can see the patterns and systems underlying all things

http://www.clexchange.org/

THINKING ROUTINES THE HOW

http://www.pz.harvard.edu/resources/thinking-routines-video



THINKING ROUTINES FOR EXPLORING SYSTEMS

Parts, Purposes, Complexities

Handout

Using the routine and the item you were given, discuss with your team what parts, purposes and complexities make up your item.

- Suggested Objects for Parts, Purposes, Complexities Take-apart Activity

Generally speaking, small electronics, mechanic tools and instruments, or mechanical toys work best for this activity. The older these objects are the better, as they will likely be easier to take apart and understand once you get below the surface. A short list of suggested objects includes the following:

- Old Walkmans, VCRs, radios, rotary telephones, and wind-up clocks
- Old mechanical kitchen tools such as egg beaters and flour sifters
- Old small appliances such as hand mixers, hair dryers, small vacuum cleaners, and desk lamps
- Old mechanical wind-up toys, Jack-in-the-boxes, or traditional music boxes
- Singing and dancing toys like stuffed animals or animated holiday decorations
- Mechanical household objects, such as door handles, locks, and hinges

EXPLORING SYSTEMS

Parts, People, Interactions

Handout

Using the thinking routine, discuss with your team how your item is part of a system that includes people and intereactions.

EXPLORING SYSTEMS

Think, Feel, Care

Handout

Using your item, focus on one group of people you identified when you used the Parts, People, Interactions thinking routine. Now, using the Think, Feel, Care thinking routine, discuss the needs and interests of this stakeholder group. Be sure to review both sides of the thinking routine, avoid stereotypes, and consider multiple perspectives.

EXPLORING SYSTEMS

Imagine If…

Handout

Now refine your item using the Imagine If…Routine. What if the item could be redesigned. Could it be redesigned to be more effective? More efficient? More beautiful? More ethical? Or more _____ (fill in the blank)? As a group, choose one of these ideas (e.g., more ethical, more effective, etc.) and think about how you might redesign your object or system for this goal.

MORE THAN JUST MAKING

Connect/Extend/Challenge

How are Systems Design and Student Agency ***connected*** to something you already know about?

What new ideas or impressions do you have that ***extended*** your thinking in new directions, especially regarding gifted/talented students?

What is ***challenging*** or confusing? What are you leaving here ***wondering*** about?

RESOURCES

Artful Thinking - http://www.pz.harvard.edu/projects/artful-thinking

- Agency by Design - http://www.agencybydesign.org/
- Creative Learning Exchange - http://www.clexchange.org/
- Harvard Graduate School of Education online programs - http://www.pz.harvard.edu/professional-development/online-courses/thinking-learning-in-a-maker-centered-classroom
- Project Zero - http://www.pz.harvard.edu/resources/thinking-routines-video
- Visible Thinking - http://www.pz.harvard.edu/projects/visible-thinking