

SYSTEM DYNAMICS AND SUSTAINABILITY

The persistent challenges that show up most in our communities—chronic disease, environmental degradation, racism, traffic, poverty, the growing gap between haves and have-nots—often share common characteristics and related causes. They defy quick fixes, they build and dissipate slowly over time, they are rarely “owned” by any organization but affect all, and their components are tightly coupled. These challenges are “systems problems.” A growing number of schools and educators are beginning to incorporate systems thinking in their methodology and their course material.

Courses

Georgia Tech

A CIVIL ENGINEERING SYSTEMS COURSE

<http://esd.mit.edu/symposium/pdfs/papers/amekudzi.pdf>

This course introduces students to a systems perspective on civil infrastructure and services and to the concept of sustainability as it relates to the planning, design, construction and operation of civil engineering systems. These concepts are introduced in various aspects of problem-solving, including problem definition; use of analysis tools for evaluating the performance of facilities and services; incorporation of benefits and costs into decision-making, and the assessment of environmental and social impacts.

Indiana University

UNDERSTANDING SYSTEMIC CHANGE IN EDUCATION

<http://education.indiana.edu/~frick/siggs.html>

In this seminar we will work in a truly cooperative venture to build the foundations for an eventual multimedia simulation of educational systems. By observing the consequences of certain decisions and actions, users can learn from mistakes -- without suffering the consequences had such changes actually been made in a real educational system. Such a tool could help educators, students, parents, school boards and administrators, and communities at large to make intelligent decisions about how to improve or change their own educational systems. The goal is to create a manuscript which can help others to understand these systems properties and, in turn, to understand the hypotheses of the educational systems theory

Infinite Futures

USING SYSTEMS APPROACHES

<http://www.infinitefutures.com/resources/sylsystems1.shtml>

This course will acquaint participants with systems science and its contributions and usefulness to the field of futures studies. Starting with a history of systems science and its branch fields, the course will identify and define the assumptions and basic concepts underlying systems science, reviewing examples of systems analysis in various subject areas [approximately the first quarter of the course]. Next participants will practice applied systems modeling using examples of their own choosing [second quarter]. Linked to systems theory are the assumptions and basic concepts of equilibrium theory, complexity theory, and chaos theory, which have emerged in the latter half of this century as formative paradigms in both natural and social sciences. The course will introduce students to the basic

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assumptions, concepts, and emerging applications for these theories [third quarter]. Finally, participants will review the critiques of systems science and related theories.

MIT: Sloan School of Management

SYSTEM DYNAMICS FOR BUSINESS POLICY Prof. John Sterman

<http://fmsdm.mit.edu/sdm/index.html>

This course uses system dynamics modeling for the analysis of business policy and strategy. Students learn to visualize a business organization in terms of the structures and policies that create dynamics and regulate performance. The course uses role playing games, simulation models, and management flight simulators to develop principles for the successful management of complex strategies. Special emphasis will be placed on case studies of successful strategies using system dynamics

The Open University

SYSTEMS THINKING: PRINCIPLES AND PRACTICE

<http://www3.open.ac.uk/courses/bin/p12.dll?C01T205>

This course offers thinking skills – systems thinking – to help you cope with the practical demands of apparently complex or confusing situations. Systems thinking acknowledges the different perceptions, priorities and needs of the different groups and individuals involved in a situation. It addresses complexity by enabling you to view the situation as a whole. It focuses on different aspects of the situation in turn, within a framework which develops your awareness of the interconnections between things and the effects these generate. Systemic approaches are increasingly used in a range of academic disciplines. This course develops your ability to think systemically, by applying a systemic approach to five different application areas, during the first five blocks of the course. These are: perceiving and learning about situations; the individual in relation to others; environment and sustainability; managing in organizations; globalization and the information society.

SUNY Albany

SYSTEMS THINING AND STRATEGY DEVELOPMENT

http://www.albany.edu/grad/courses/r_pad.html

The course presents a set of concepts and tools for thinking through complex system-wide problems that challenge government managers' ability to design and manage cross-agency and intergovernmental policies and programs. Students will learn to diagnose and solve complex system-level problems by applying systems thinking and strategic planning tools to case examples.

University of Oregon

SYSTEMS AND SUSTAINABILITY

http://darkwing.uoregon.edu/~utopia/F03-04Wrksh_t_files/455-555Systhink.htm

This course will provide theory and practice of systems thinking as it applies to sustainability. The adoption of environmentally, socially, and economically sustainable policies and programs requires a basic understanding and skills in systems thinking. If we understand the systemic structure that shapes and influences the behavior of organizations and communities, it becomes possible to see what creates the actions we observe. This awareness allows us to develop policies and programs that change the source of the problem rather than just responding with another quick fix and dealing with symptoms. This is the focus of systems thinking. The power of systems thinking comes from a focus on systemic structures, which is where the greatest leverage for problem solving and positive change lies. A systems approach can help shed light on current problems—especially those that seem to continually repeat—by helping policy and program managers see them from a different perspective. Systems thinking offers a range of tools for gaining deeper insight into problems—from simple causal-loop diagrams and systems archetypes to more complex computer simulation models.

Worcester Polytechnic Institute

ENVIRONMENTAL DYNAMICS

<http://www.admissions.wpi.edu/Academics/Programs/sd.html>

Environmental Dynamics introduces the system dynamics students to the application in environmental systems. The course materials include the book Modeling the Environment, a supporting website, lectures and the corresponding power point files. Students learn system dynamics with examples implemented

with the Stella software. The course includes a variety of small models and case applications to water shed management, salmon restoration, and incentives for electric vehicles to reduce urban air pollution

Readings

ANTS, GALILEO, AND GANDHI: Designing the Future of Business through Nature, Genius and Compassion, Sissel Waage, Editor, Chelsea Green, 2004

BEYOND THE LIMITS, 1992 by and Donella Meadows and Dennis Meadows

BUSINESS DYNAMICS: Systems thinking and Modeling for a Complex World, John Sterman, 2000

THE FIFTH DISCIPLINE: The Art and Practice of the Learning Organization
Peter M. Senge, October 1994

LIMITS TO GROWTH: the 30-year Update, 2004 by Donella Meadows, Jorgen Randers, and Dennis Meadows

<http://www.chelseagreen.com/2004/items/limits>

SYSTEMS THINKING & PROFESSIONAL PRACTICE

<http://www.sustainabilityalliance.org.uk/sustainabilitysystemspractice.html>

SYSTEMS THINKING - Critical to Sustainability Education

<http://ceres.ca.gov/tcsf/seg/page20.html>

SYSTEMS THINKING – What it is; What it hopes to accomplish

<http://www.newswithviews.com/Stuter/stuter11.htm>

Resources

Creative Learning Exchange <http://www.clexchange.org/>

Friends of Ishmael <http://www.friendsofishmael.com/action/online/mosaic.shtml>

The Journal “Systems Dynamics Review”. www.interscience.wiley.com

Leverage Points <http://www.pegasus.com/levpoints/lp.html>

MIT Systems Dynamics Group <http://sysdyn.clexchange.org/sd-group/>

Natural Logic <http://www.natlogic.com/>

The Natural Step www.naturalstep.org

Northwest Institute <http://www.nwei.org/>

Society for Organizational Learning <http://www.solonline.org/>

The Sustainability Institute <http://www.sustainabilityinstitute.org/>

The SD Mega Link List <http://www.uni-klu.ac.at/%7Egossimit/linklist.php>

The Systems Thinking Collaborative <http://www.stcollab.com/about.html>