Guided Study Program in System Dynamics

System Dynamics in Education Project
System Dynamics Group
MIT Sloan School of Management

Assignment #1

Reading Assignment:

Please refer to Road Maps 1: A Guide to Learning System Dynamics (D-4501-4) and read the following papers from Road Maps 1:

- *Systems 1: An Introduction to Systems Thinking*[2]
- System Dynamics and Learner-Centered-Learning in K-12 Education (D-4337-1)

We recommend that you read *Systems 1* carefully. The book describes some of the most important concepts of system dynamics that we will revisit many times throughout the program. We also encourage you to read the Appendix; some of the questions in this assignment are based on the Appendix.

Also read the following:
- *Principles of Systems*,[3] by Jay W. Forrester, Chapter 1

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[2] Kauffman, Draper L. J., 1980. *Systems 1: An Introduction to Systems Thinking*. Instructions for obtaining this book are provided in Road Maps 1: A Guide to Learning System Dynamics (D-4501-4).
[3] Forrester, Jay W., 1968. *Principles of Systems*, (2nd ed.). Portland, Oregon: Productivity Press. 391 pp.

Exercises:

All of the following exercises should be answered with a short paragraph. In this assignment, there are no right or wrong answers. We are trying to help you understand the principles covered in the readings by identifying the presence of dynamic systems in your everyday life.

1. Systems 1: An Introduction to Systems Thinking

A. Chapter One: What is a System?

Choose one of the following systems. Describe its different elements and how they interact with each other in terms of feedback:[4]

- quitting smoking
- procrastination
- learning a new skill
- dieting
- studying/goofing off

B. Chapter Two: Stability

Give two examples of "self-regulating" systems and explain briefly how they work.

C. Chapter Three: Things in Common

Choose two of the following types of systems. Think of a real-life example of each and explain briefly:

- loose systems
- systems with time limits
- systems that anticipate warnings
- counter-intuitive systems
- hidden systems
- vulnerable systems

D. Chapter Four: Change and Growth

Discuss the explosive growth of the internet by identifying its positive feedback loops.

E. Chapter Five: Putting the Pieces Together

Is there a limit to internet growth? If so, what are some of the limiting factors? What is the effect of competition on internet growth?

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[4] This exercise is based on: *Conceptualization Exercise* (D-2610-3), 15.873: Principles of Dynamic Systems II, Sloan School of Management, Massachusetts Institute of Technology, based on an exercise by Alan Graham, revised by John Sterman.

F. Chapter Six: Complex Systems

This chapter describes ten characteristics of complex systems. Choose three and illustrate with a real-life example of each.

G. Appendix: System Notes

Choose three out of the twenty-eight system notes. For each, give an example that demonstrates the rule. Explain briefly.

2. System Dynamics and Learner-Centered-Learning in K-12 Education

Give a source of educational ineffectiveness from your personal experience. You do not have to restrict yourself to a K-12 setting. Propose a learner-centered-learning alternative.

3. Principles of Systems: Chapter 1

Please read Chapter 1 of *Principles of Systems* and work through the workbook exercises for this chapter. The workbook is located at the end of the book. You do not need to submit anything for this reading assignment, but you should let us know if you have any questions about the material.