Connection to Characteristics of Complex Systems Project

Lesson Title: *Modeling Dynamic Systems*, Section 8: Urban Dynamics
Overview: *Modeling Dynamic Systems: Lessons for a First Course (3ʳᵈ Edition)* is a model-based curriculum developed by Diana Fisher.
Related Characteristic(s) of Complex Systems: • High-leverage policies are difficult to apply correctly. • Action is often ineffective due to application of low-leverage polices.
Ideas and Examples for Connecting to the Characteristic: Section 8 of *Modeling Dynamic Systems* introduces students to the study of urban growth, based on Jay W. Forrester's classic system dynamics work, *Urban Dynamics*. The following ideas can help guide a classroom discussion about leverage in complex systems: 1. What is a "high leverage" policy? What is a low leverage policy? (High leverage policies involve a small change that produces a large effect due to aligning the goals of various parts of the system; low leverage policies seem to promise change but do not deliver due to being unable to align the goals.) Identify and discuss policies of both types that were used by the students when working with the model. 2. Forrester found that the amount of low-income housing a city contains is a high-leverage policy, but he recommended cities build *less* of it, not more. Why would this recommendation not only seem to be illogical, but also controversial? 3. Curitiba, Brazil implemented many controversial policies on its path to urban renewal. One of these was to close part of the downtown area to cars, creating a pedestrian zone. Discuss why such a move goes against conventional "wisdom" to build more and better infrastructure to handle increasing traffic loads.
Resource(s) *Modeling Dynamics Systems,* Diana Fisher, available here: http://www.iseesystems.com/store/ModelingBook/default.aspx *Urban Dynamics* by Jay W. Forrester SimCity and the connection to Urban Dynamics http://en.wikipedia.org/wiki/SimCity An introduction to Curitiba, Brazil, a well-known sustainable city http://www.nytimes.com/2007/05/20/magazine/20Curitiba-t.html?_r=0