

## Connection to Characteristics of Complex Systems Project

**Lesson Title:**

*Modeling Dynamic Systems*, Section 9: Supply and Demand

**Overview:**

*Modeling Dynamic Systems: Lessons for a First Course (3<sup>rd</sup> Edition)* is a model-based curriculum developed by Diana Fisher.

**Related Characteristic(s) of Complex Systems:**

Cause and effect are not closely related in time or space.

**Ideas and Examples for Connecting to the Characteristic:**

Section 9 of *Modeling Dynamic Systems* uses models of supply and demand to teach students about delays in complex systems. The lessons include both material and information delays. The following ideas can help guide a classroom discussion about delays in complex systems:

1. Long delays in complex systems can obscure cause and effect. Products may be assembled in one country using parts shipped from a dozen other countries, then shipped around the world for sale. Discuss the implications of global supply and demand for everyday products and what happens when the supply chain is disrupted. For example, when local meat prices suddenly rise, how can citizens understand the cause, which may be a crop failure in another country?
2. Incidences of environmental pollution can provide examples of delayed effects that are felt over long distances. The time needed for pollutants to accumulate to toxic levels often means that once discovered, the effects are hundreds of miles from the source, dispersed by wind, rain and other means. Ask students to find such examples and discuss their findings with the class as a whole.

**Resource(s)**

*Modeling Dynamics Systems*, Diana Fisher, available here:

<http://www.iseesystems.com/store/ModelingBook/default.aspx>

“Largest U.S. Auto Dealer Expects Japanese Car Shortage”

<http://www.nbcnews.com/id/42414949/ns/business-autos/t/largest-us-auto-dealer-expects-japanese-car-shortage/#.Ub87ZPnCa-0>

“Apple iPad Deliveries Delayed as Demand Soars, Supplies Run

Out”<http://www.foxbusiness.com/technology/2012/03/12/apple-delays-ipad-delivery-as-demand-soars-supplies-run-out/>

”The Arctic’s on Thin Ice, and We Ain’t Seen Nothin’ Yet”

<http://www.donellameadows.org/archives/the-arctics-on-thin-ice-and-we-aint-seen-nothin-yet/>