STUDYING *THE LORAX* WITH FEEDBACK LOOPS

by Rob Quaden and Alan Ticotsky

The Lorax, by Dr. Seuss, is a classic children's book that appeals to all ages. Told in a fanciful style, the story relates how an ambitious businessman named the Once-ler exploits all the resources of a small country. Despite the warnings of a character named the Lorax, all the truffula trees are cut down and made into fast-selling products called thneeds. At the end of the story, the Once-ler regrets his actions but is it too late?

Several important themes are central to *The Lorax*. Citizenship lessons include the importance of environmental stewardship and the necessity for businesses to practice sustainable use of resources. While the characters are portrayed pretty broadly as black and white heroes or villains, in reality there needs to be room for both natural environments and economic development, creating more gray areas. The characters are driven by individual attributes, such as deciding how to behave honorably and regretting excessive greed and selfish behavior. By using systems thinking tools, the children can start to see shades of grey instead of black and white. The story presents teachers with an opportunity to bring these and other important concepts into the classroom.

With a new movie version having debuted in March, 2012, many students will be revisiting *The Lorax*, or experiencing it for the first time. A rich lesson can be made even more powerful for first-time readers by comparing the original text and drawings to the new version.

Multiple state and national standards can be addressed through *The Lorax*, as well as local curriculum topics. In this lesson, students will

- Evaluate complex information and ideas
- Express logical arguments
- Understand systems
- Consider sustainability and environmental issues in relation to business growth

HOW IT WORKS

Many themes interact in the book. The natural growth cycle of business dominates for a while. The Once-ler makes lots of money, uses it to expand his business and employ his relatives, and makes even more money. But growth cannot continue forever, and natural resources become depleted. Pollution plagues the country and the tree population declines until it is no longer possible to produce thneeds. The Lorax's voice of dissent is ignored until the treasures of the land are spoiled.

In this lesson, students read *The Lorax* and then develop a connection circle and causal loops to understand and illustrate the themes of the story. Students will investigate how cycles compete for dominance, and think about how the needs of business and natural resources can collide.

MATERIALS

- Copy of *The Lorax* by Dr. Seuss

For each team:

- Copies of the Connection Circle template

PROCEDURE

1. READ THE STORY

The teacher should decide the best method appropriate to his or her class—read aloud, shared reading, etc.

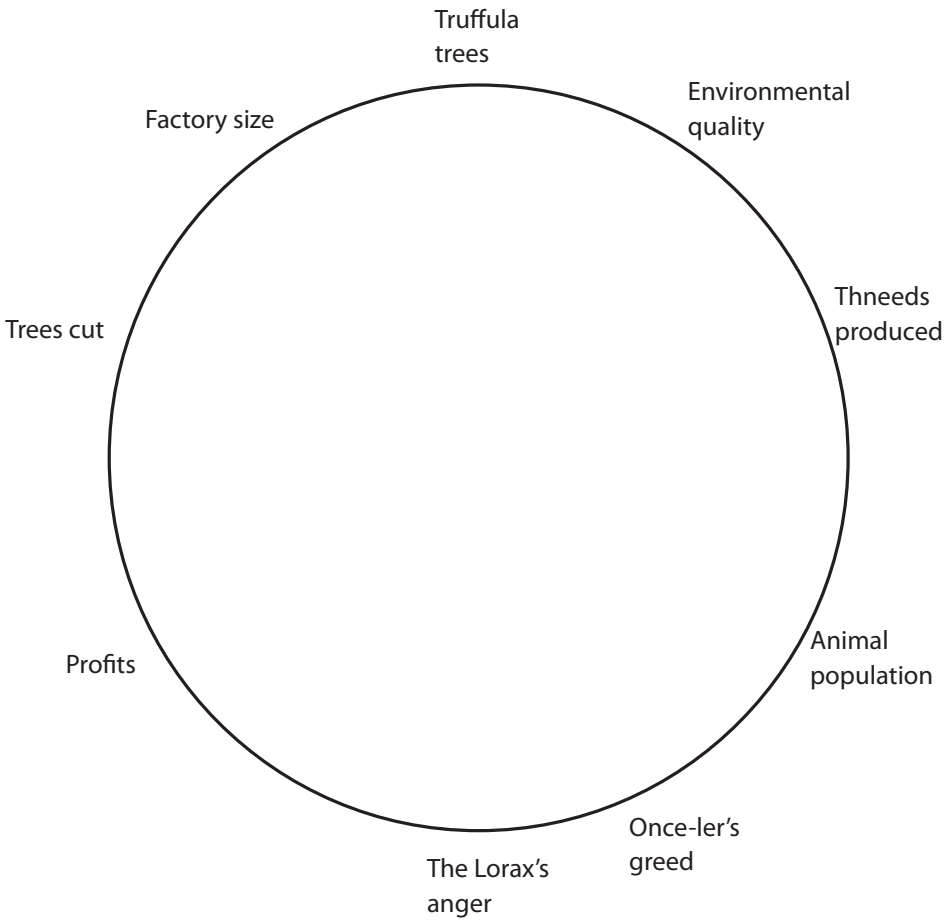
2. PREPARE THE CONNECTION CIRCLE

If students have never used connection circles before, go over the rules for finding the elements of the story as listed on the template at the end of this lesson plan. Each student can use a copy of the template or they can draw their own circles. We suggest working in teams to encourage sharing of ideas. (For a full explanation, see *The Shape of Change*, by Rob Quaden and Alan Ticotsky, Creative Learning Exchange, 2004, available on the CLE website.)

3. CHOOSE THE ELEMENTS

Without too much prompting, students should identify the important elements that change in the story. Encourage them to talk in teams while each student in the team creates his or her own connection circle. Possible elements include truffula trees, thneeds, pollution, Once-ler's greed, Once-ler's profits, the Lorax's anger, factory size, and other things that change quantitatively during the story.

It may help to bundle the animals affected by the habitat degradation into one element rather than listing them individually. After students have worked in teams for a short time, lead a whole class session, allowing students to share the elements they have chosen. The teacher can build a composite circle on the overhead or a chart pad. Each team may have a different interpretation, so the circle produced by the whole class may have more elements than individual team circles. Building connection circles can help represent and clarify divergent thinking.



Sample of elements around a connection circle

"I believe we should give students a more effective way of interpreting the world around them. They should gain a greater and well-founded confidence for managing their lives and the situations they encounter."

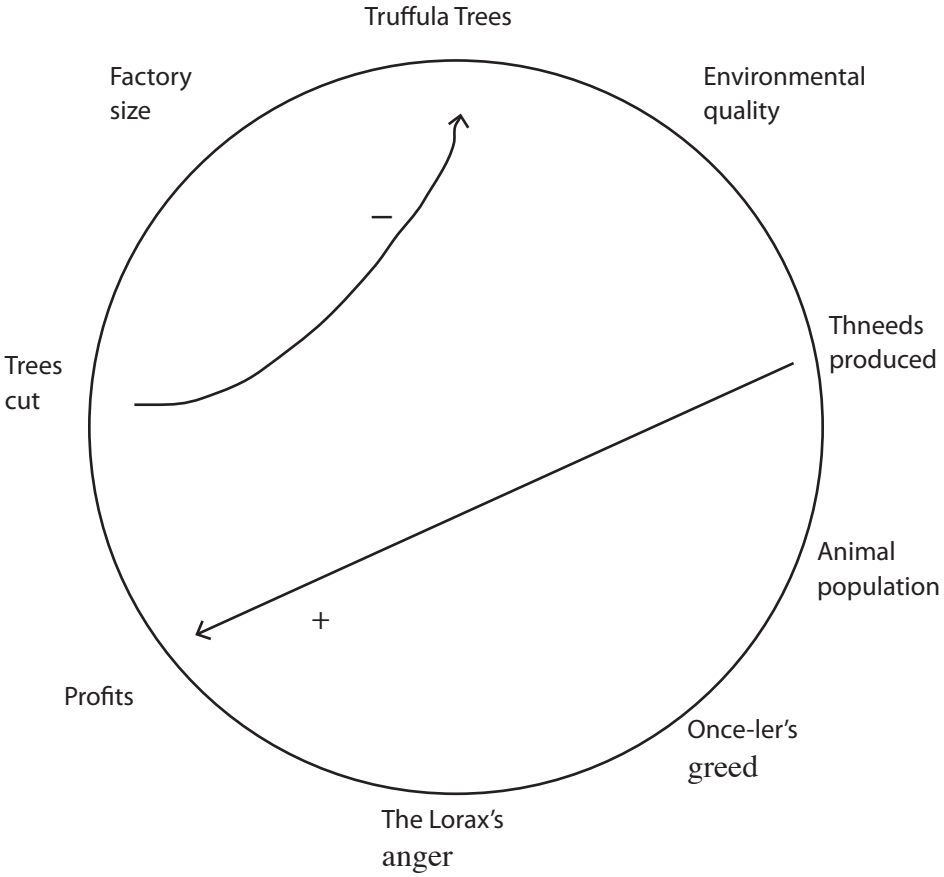
Dr. Jay Forrester, 1994

4. Next, ask students to identify an element around the circle that changes quantitatively in the story and causes another element to change. Draw an arrow from the cause to the effect. You may label the direction of the change by putting a + or – sign near the arrow head. Use a + sign when the change is in the same direction and a – sign when the change is in the opposite direction.

In the example below, the link from "Thneeds produced" to "Profits" is + because producing thneeds adds to profits. The link from "Trees cut" to "Truffula trees" is – because cutting trees reduces the number of trees.

> Students may be confused at first when using + and – because the signs do not always mean more and less. In the link between "thneeds produced" and "profits," when production goes down, profits go down also. That's still a positive (+) causal relationship because the elements move in the same direction. When the elements move in opposite directions, the causal relationship is negative (–).
>
> A trickier example is births and population. Even when the number of births decreases, "births" to "population" is a positive (+) causal relationship, since any birth increases the population. Both elements move in the same direction.

One or two examples should be enough to get students started. Have them work in teams as each student draws his or her own connections.



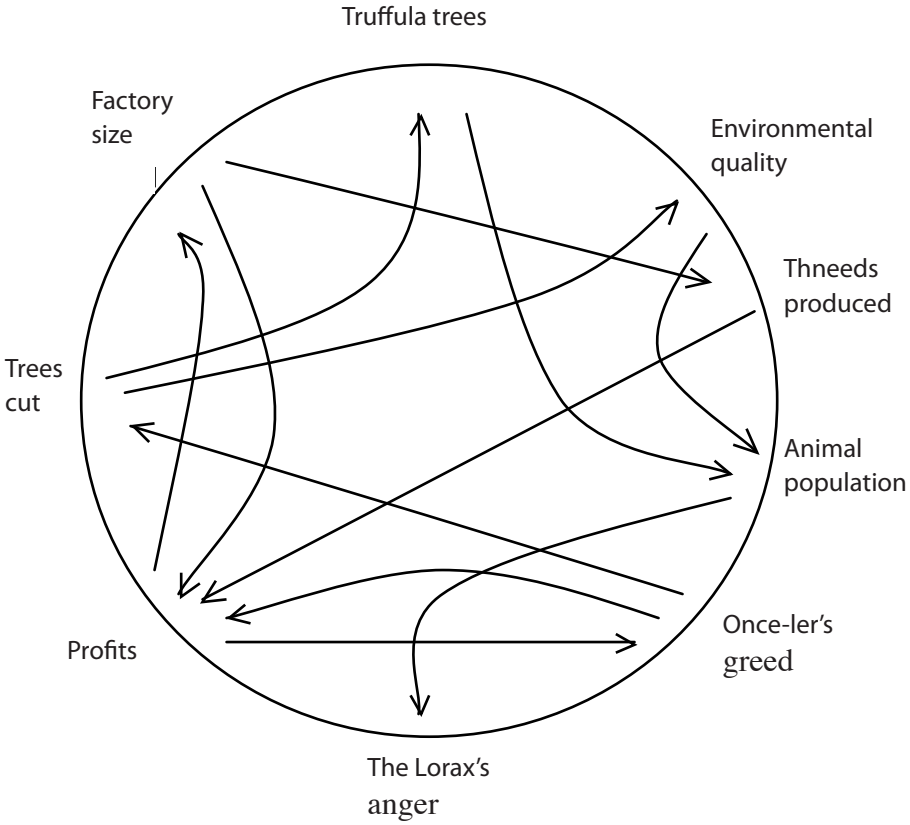
Sample of elements around a connection circle, with a few arrows from cause to effect

5. After students have had a short time to work in teams, bring the class together to share some of the connections. The circles may look cluttered with arrows at this point. (See Partial Diagram on next page.) Ask if students can trace a path so that they can start at one element, travel along the arrows to at least one other element, and return to the starting point.

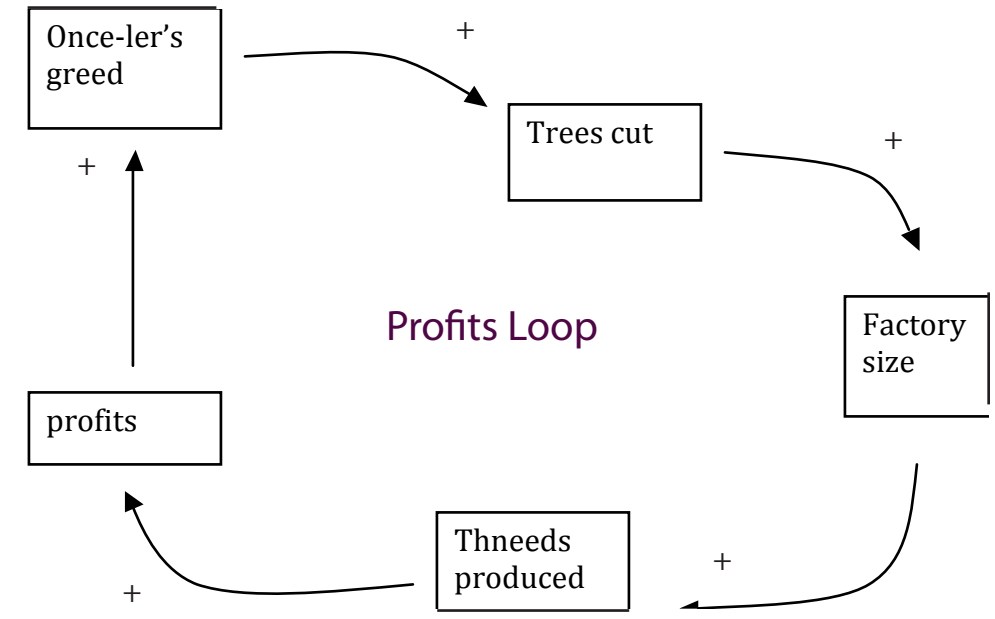
6. Instruct students to trace over the pathways using highlighting pens or colored pencils.

7. Have them copy the pathways they have traced onto a separate page, drawing them as loops. Choose representatives to draw these loops on the board or on overhead transparencies in order to share them with the class. Name the loops for reference. Students should gain insight as they look at loops and find leverage points within the story.

Elements around the circle with arrows in only one direction (coming in only or going out only) indicate that students have not identified feedback loops containing that element. In some cases, the element is not central to the story, or the information available doesn't tell us enough to make another connection. Sometimes students need to add an element to the circle to complete a loop.



Partial Diagram: Sample of elements around a connection circle, with many arrows from cause to effect



Complete Loop

Benefits of Systems Thinking

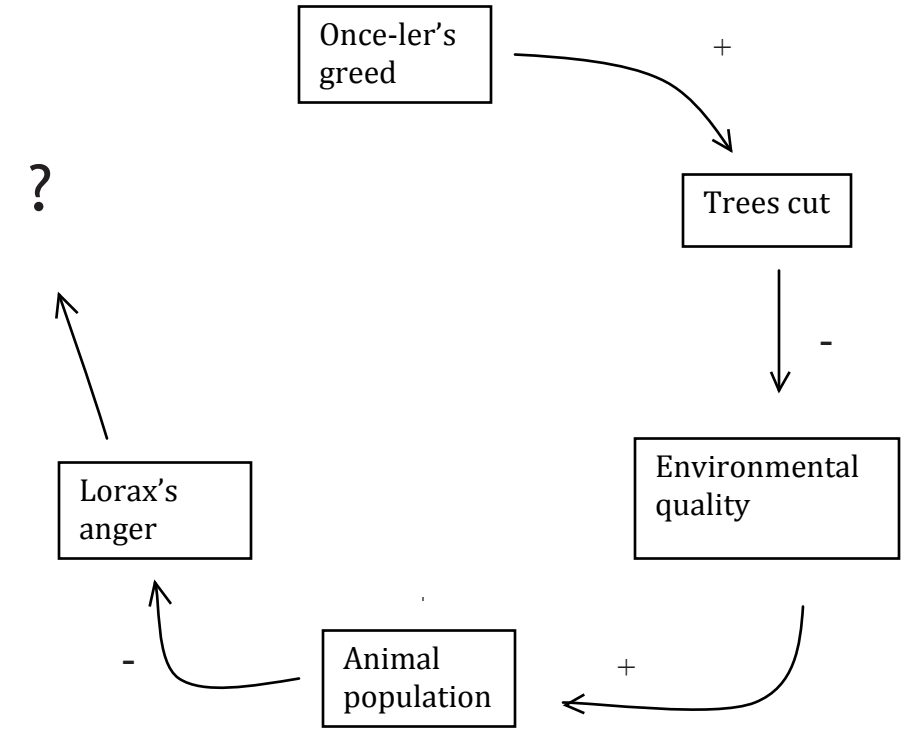
- Makes student thinking visible
- Helps students make connections
- Allows students to explore multiple ways to solve problems
- Develops reading and writing skills
- Increases student engagement

The examples that follow demonstrate one complete loop and one incomplete loop. The complete loop (below left) tells that as the Once-ler's greed increased, he cut down more trees. That led him to increase the factory size. More thneeds were produced, which increased profits. As profits grew, the Once-ler's greed grew as he continued to seek more wealth. This might be named the "profits" loop or the "greed" loop.

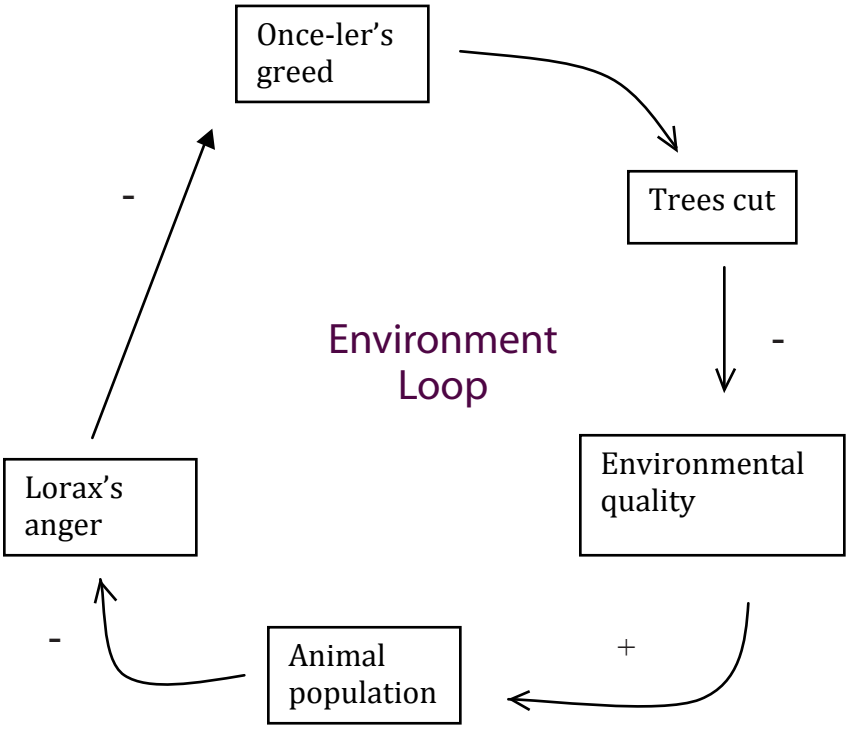
Stocks

Once the important loops are identified, it is good practice to put a rectangle around the elements and talk with the students about the fact that the elements in the story are stocks.

Elements or units that go up and down, that can accumulate or diminish, are called stocks. (See Quaden,Ticotsky and Lyneis, "In and Out Game," from The Shape of Change, available from the Creative Learning Exchange website, www.clexchange.org.)



Incomplete Loop



Environment Loop

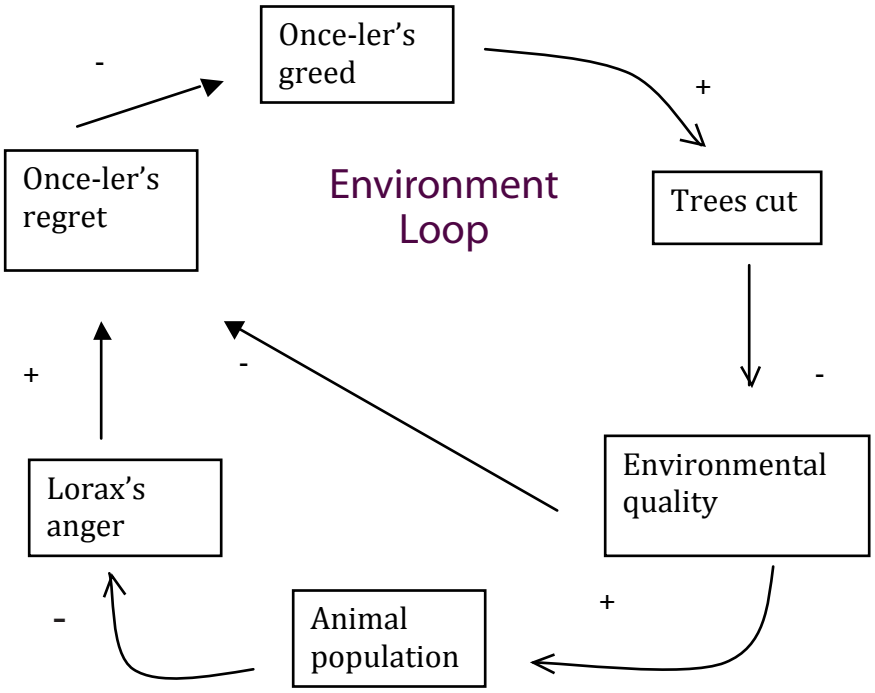
8. DEALING WITH INCOMPLETE LOOPS

Examine an incomplete loop with the students. In the example on the left, the Once-ler's greed grows, and more trees are cut down. Environmental quality decreases, causing a decrease in the animal population. As the animal population goes down, the Lorax's anger goes up. What does the Lorax's anger cause?

Students will probably face this question. Does the Lorax's anger affect the other elements of the connection circle? Or, to state the question from a systems perspective, is there any feedback resulting from the anger?

Some students will contend that the Lorax's anger actually makes the Once-ler greedier or at least more determined to exploit the Truffula trees. "Business is business" after all. Another interpretation is that there is a long delay in the story. After the environment is destroyed, the Once-ler finally feels regret. The "Lorax's anger" reduces "Once-ler's greed" as the ruined entrepreneur now understands what he has done. That closes the loop, making an Environment Loop (lower left) to contrast with the Profits Loop.

Sometimes a new element is needed to close a loop. Students may add a factor that does not appear on their connection circle. For example, "Once-ler's regret" may be an element that changes during the story, caused by the Lorax's behavior or the overall degradation of the environment, or both. Then the Once-ler's regret reduces or eliminates his greed. See the Environment Loop on the next page.



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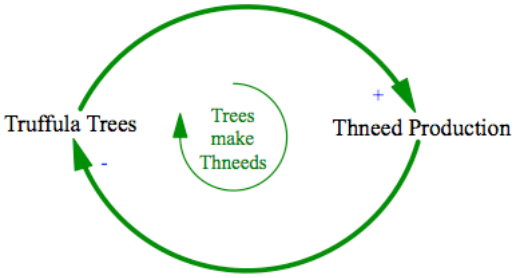
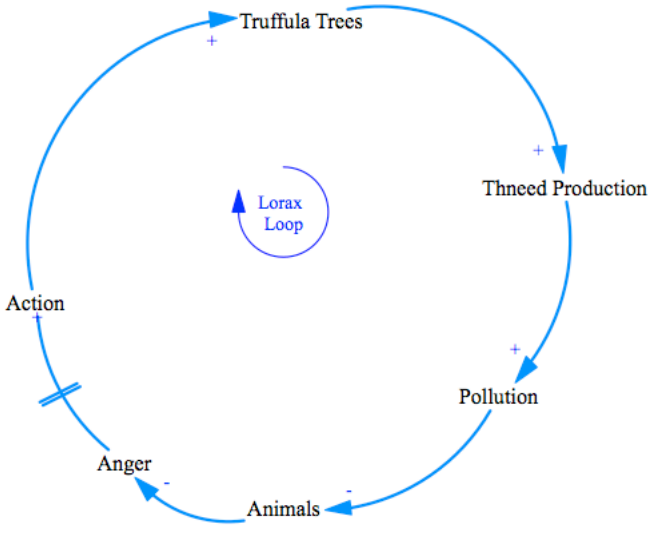
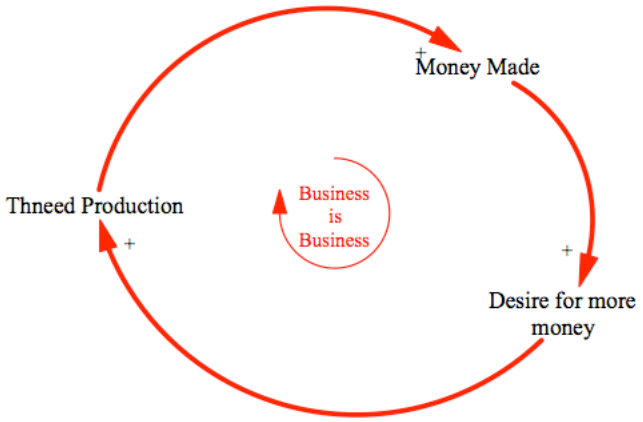
9. COMBINING THE LOOPS

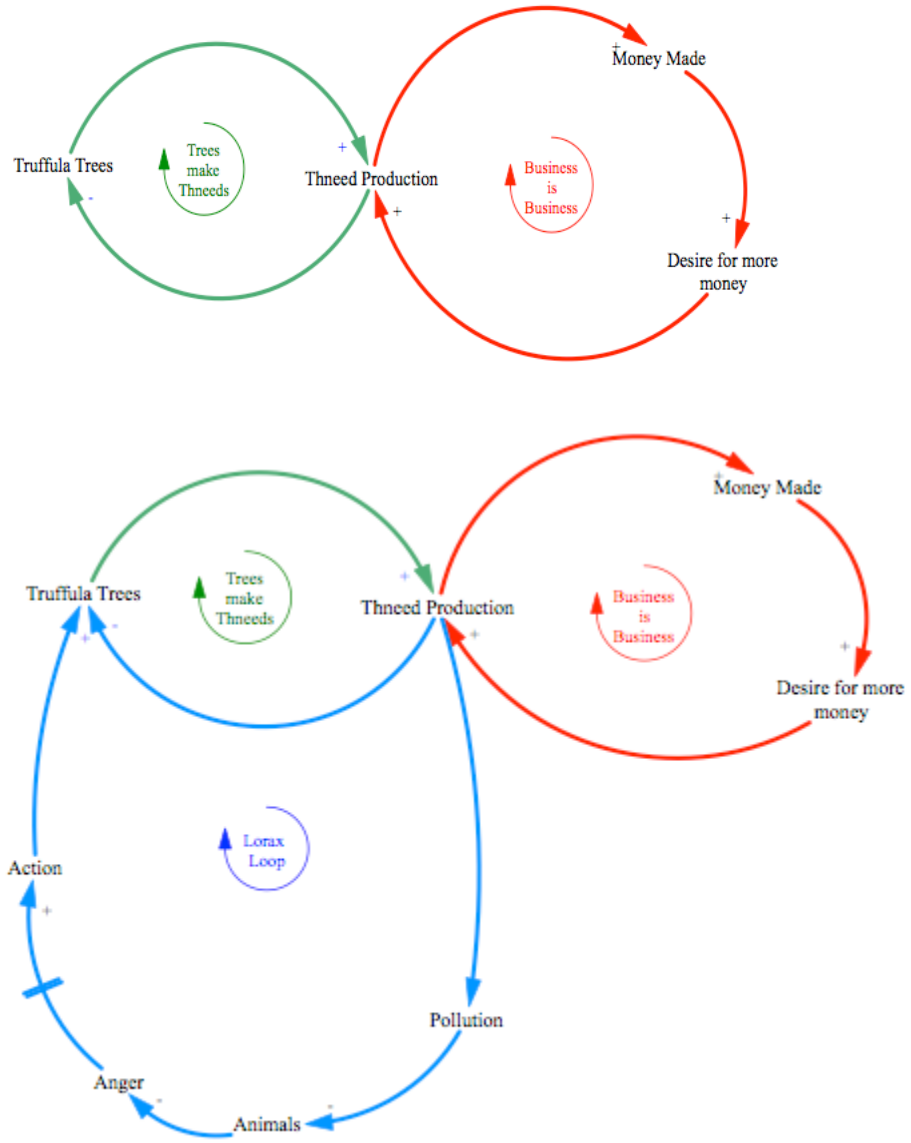
Once students have developed two or three loops, check to see if an element is part of more than one loop. Where elements overlap, two loops can be combined. Students in one class developed three loops.







The element "Thneed Production" occurs in all three loops, so the loops can be combined:



Once the loops are combined in one diagram, encourage students to state the dynamics of the Lorax story in their own words. By referring to the different loops in the diagram, students can trace how different loops dominate at different points in the story. Seeing how loop dominance changes and affects complex systems is an important technique.

10. SUMMING UP

Use this lesson plan as an example, and expect that students will have differing opinions about *The Lorax*, as they will about any complex issue. Encourage students to use the connection circle tool to find feedback loops that will help explain and illustrate their arguments.

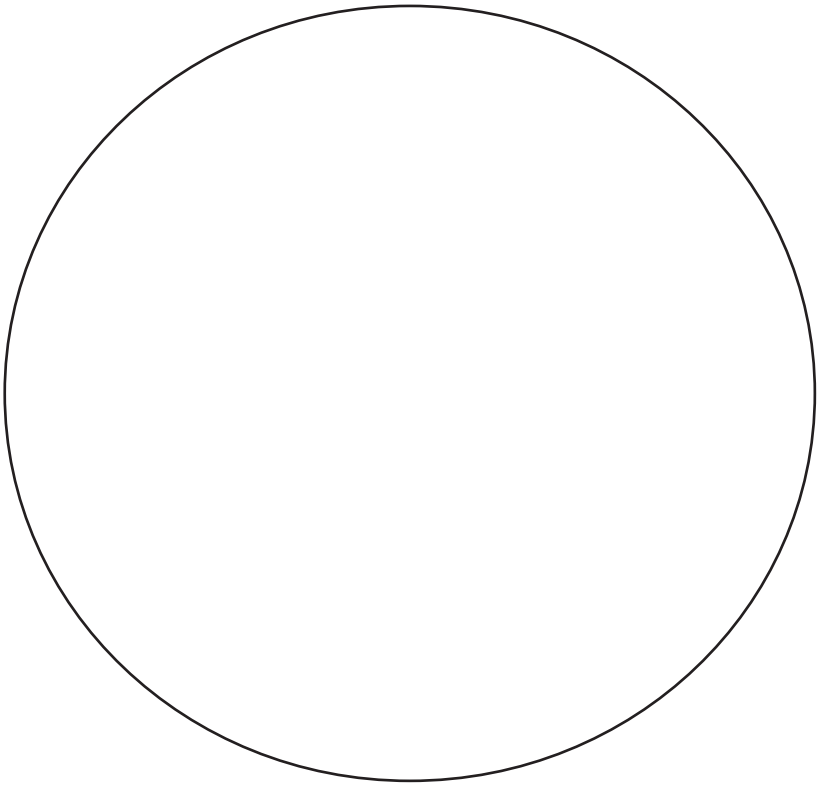
Stories and issues often hinge on conflicting loops. Dominance among loops may change and affect the story, as it does in *The Lorax*. The Profits Loop, the Production Loop, and the Lorax's Environment Loop are all connected. Students will see that the loops contain some elements in common. Wherever humans build, these loops will come into play. While there are no easy solutions, understanding the feedback loops helps us understand the situation and make more informed decisions.

NAME _____

CONNECTION CIRCLES

Rules

1. Draw a large circle.
2. List important elements around the circle.
   A. Restrict the number to between five and ten.
   B. All elements should be nouns or noun phrases.
   C. Elements can increase or decrease.
3. Identify an element that causes another element to increase or decrease.
   A. Draw an arrow from the cause to the effect.
   B. Make sure that the causal connection is a direct one.
   C. Identify polarity of arrow and label with a + or a - near the arrow head.
4. Continue to identify elements with causal connections.



Connection to Characteristics of Complex Systems Project

Lesson Titles:
Lessons from *The Lorax*: Using Graphs to Study Change
Studying *The Lorax* with Feedback Loops

Overview:
These two lessons on Dr. Seuss's classic children's book, *The Lorax*, provide a rich opportunity to students to learn environmental stewardship and why businesses must practice sustainable use of resources.

Related Characteristic(s) of Complex Systems:
- Conflicts arise between short-term and long-term goals.
- Cause and effect are not closely related in time or space.

Ideas and Examples for Connecting to the Characteristic:
Individuals or groups may use resources to meet short-term goals at the expense of sustaining those resources over the long-term. In *The Lorax*, a business run by the Once-ler depletes the truffula trees to make products called thneeds.

Ask students questions such as, "What is the Once-ler likely to do if demand increases?" "What should the Once-ler do to ensure sustainability into the future?" "How many thneeds can be made when all the truffula trees are gone?" "What happens to the population without thneeds?"

An archetype, such as the Tragedy of the Commons, can illustrate how using a resource faster than it can regenerate leads to the loss of that resource. If the short-term goal is to harvest as much of the resource as possible, then the resource will decline (and possibly run out) in the long-term.

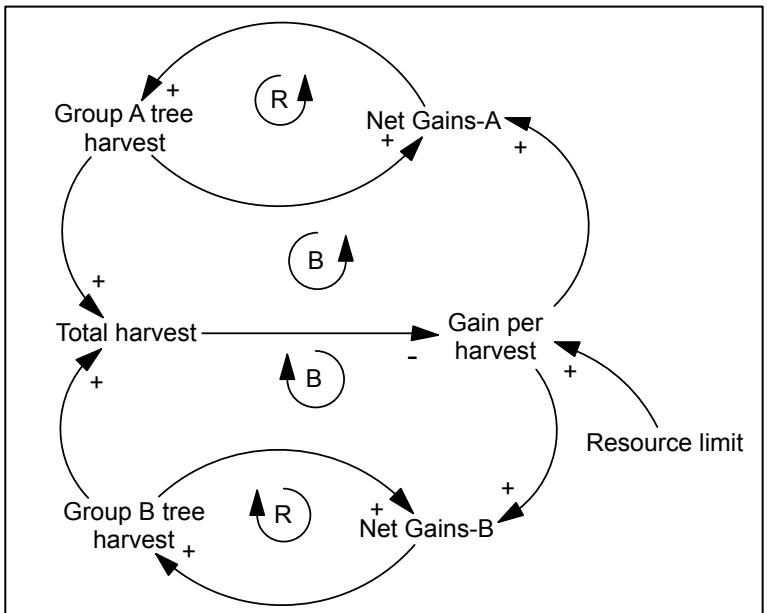


Figure: Example of Tragedy of the Commons

A stock/flow diagram shows how the system has long delays. Once the damage is recognized (the resource is depleted), the problem cannot be fixed immediately; regeneration of trees can take generations. When cause and effect are separated by time, it can be difficult to link the two together and see them as parts of a single system.

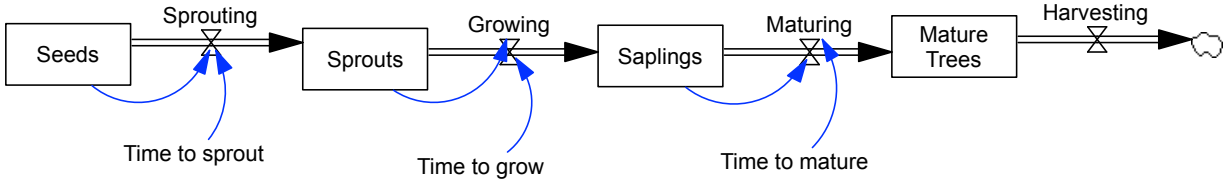


Figure: Stock/Flow diagram with time delays

Resource(s)

Other ideas for teaching *The Lorax* in the classroom:
http://www.seussville.com/Educators/lorax_classroom/educatorlorax_plan.php

"Road Maps 4—A Guide to Learning System Dynamics"
http://clexchange.org/ftp/documents/Roadmaps/RM4/D-4504-7.pdf