

Infection Game For Primary Students (Grades K-3)

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*adapted from **The Shape of Change: The Infection Game** by Rob Quaden and Alan Ticotsky with Debra Lyneis*

Illustrated by Nathan Walker

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Introduction

This lesson is similar to the “The Infection Game” lesson in *The Shape of Change*. The activity rules are modified for younger children who do not know the concept of multiplication. The handouts and debrief questions are aimed at younger students. In addition, a simple online simulation is available as an extension.

Students explore what happens to the number of people “infected” over time. Infections can include the spread of an illness, the spread of a good idea, or the spread of kindness. Students can share other ideas during the conversation. Instruction can focus on health concerns, classroom culture, and/or mathematical patterns produced.

Connection to Standards

The lesson strongly connects to curricular math standards and to aspects of classroom culture.

Example standards include:

Common Core Math – Example Standards

1. Represent and solve problems involving addition and subtraction. (Grades 1 and 2)
2. Work with addition and subtraction equations. (Grade 1)
3. Model with mathematics. (Grades K-3)
4. Look for and make use of structure. (Grades K-3)
5. Represent and interpret data. (Grades 1 - 3)

Common Core ELA – Example Standards

1. Speaking and Listening: Ask and answer questions about key details in a text read aloud or information presented orally or through other media. (Grade 1)
2. Speaking and Listening: Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings. (Grade 1)

National Health Educational Standards:

Standard 1 – Students will comprehend concepts related to health promotion and disease prevention to enhance health.

Standard 5 – Students will demonstrate the ability to use decision-making skills to enhance health.

Standard 7 – Students will demonstrate the ability to practice health-enhancing behaviors and avoid or reduce health risks.

Standard 8 – Students will demonstrate the ability to advocate for personal, family, and community – health.

Six Pillars of Character Education – trustworthiness, respect, responsibility, fairness, caring, citizenship

How It Works

Students play a game that simulates the spread of an infection. Students in the class represent individuals. At the beginning, only one student is “infected.” During each round, the infection can spread. Students are not aware that an infection is spreading while playing the game. They simply color in squares, either red or blue, based on a simple rule (see Figure 1 and Handout 1).

A class of 14 or greater can play this game. If the class has an odd number of students, the teacher or another adult will need to play as well. You may also choose to combine two classes (up to 40 students total).

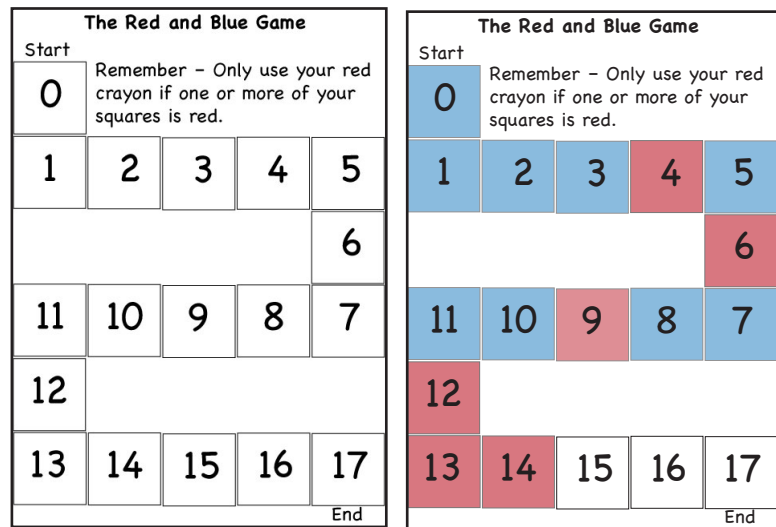


Figure 1: Blank and Example Completed Game Boards

Materials

- Computer, projector, and whiteboard (regular or interactive) with spreadsheet open (optional) or a large graph (Figure 2) drawn on the board. Create the scale on the y-axis to be slightly larger than the total number of students playing. For a class of 23 students, create a graph that goes to 25 students, going up by fives.
- Document camera (optional) for creating the graph and stock/flow map
- Excel spreadsheet with table/graph (See separate file)
- Handout 1: Game Board
- Handout 2: Graph A, B, or C
- Handout 3: Infection Stock/Flow A or B
- One red and one blue crayon per student

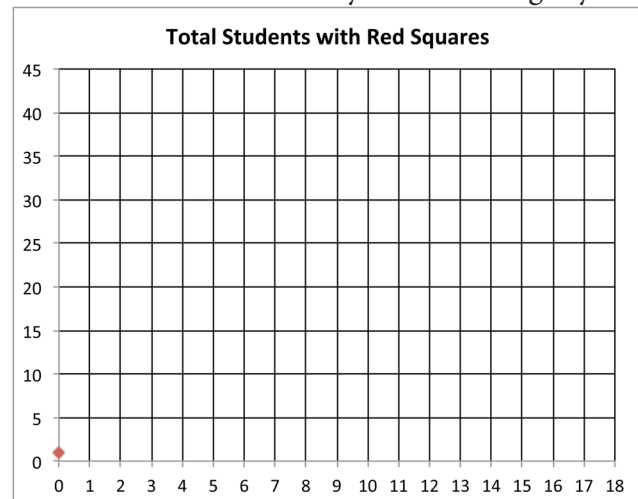


Figure 2: Blank Graph A

Procedure

Note that this procedure was tested with first grade students; modify as needed for younger or older children.

- Make sure you have an even number of players. If not, have an adult be a player alongside the students.
- Let students know that they’ll be playing a game. Each student will receive a game board.
- Show a game board and demonstrate coloring in a square (all the way).
- Hand out a red crayon to only one student and blue crayons to all other students. Older students may need less structure, such that they could have both red and blue crayons on their desks.

- Hand out a game board to each student and have them write their names at the top.
- Have students color square #0 all the way in using the crayon they received. *Note:* The student with the red square will be the first person “infected,” although avoid mentioning anything about the meaning of the colors at this time. Red indicates having the “infection.” Blue indicates not having the “infection.”
- Describe that students are now going to color in some squares on each other’s papers. They follow some simple rules.

1. Look at your paper. Do you have any red squares? If you do, you’ll color red on your partner’s paper. If you have no red squares, you color blue on your partner’s paper. *Note:* Monitor who has a red square at the end of each round and switch out the blue crayons for red ones as needed before they trade.
2. Trade papers with someone.
3. Color the next square for that person and then give it back to the same person.

- “It’s time to color square #1. Find someone to be your partner, switch papers, and color that person’s #1 square.” Review the rules as needed during this process. Remember, once a student has a red square, he or she will always color red.

- Continue with additional squares, asking them to find a new partner each time. Watch what’s happening to determine when everyone has at least one red square. At that point, run the game a couple more rounds and then stop. It’s not necessary to do all 18 rounds. A typical completed game board is shown in Figure 1.

- Gather the data into a table and then graph it either on a board or using the Excel spreadsheet.

1. To do this, ask, “Who has a red square #0?” Enter that number in the “New Red Squares” column on the table, collect that paper, and then ask, “Who has a red square #1?” Continue asking, recording, and collecting papers until all papers have been collected. (See “New Red Squares” column in Figure 3.)
2. Then work together to calculate the total “red” students. To do this, add the total red squares from the previous round to the new red squares for this round. For example, to calculate the results for square 3, the formula is: $4 + 4 = 8$ total students with red squares.

Square	New Red Squares	Total Students with any Red Squares
0	1	1
1	1	2
2	2	4
3	4	8
4	8	16
5	11	27
6	10	37
7	2	39
8	1	40
9	0	40
10	0	40

Figure 3: Example Table Results

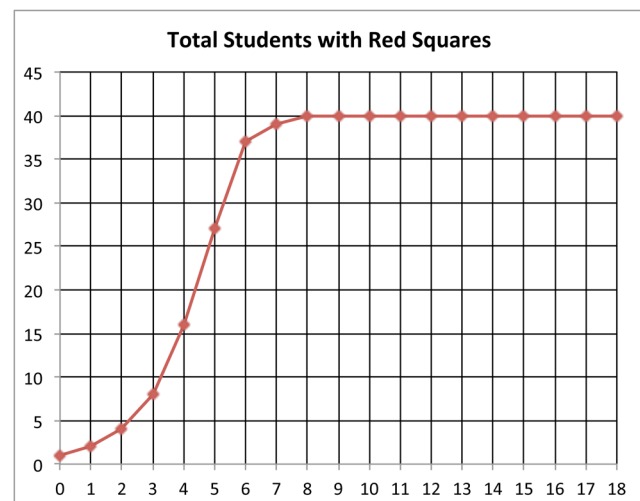


Figure 4: Completed graph

3. The actual class data will likely differ from the example, but the total can never go down. Once red, always red. (See “Total Students...” column in Figure 3.)
 4. Now graph the table data for the total students (See Figure 4 for a completed graph). If doing it on the spreadsheet, this should have happened automatically.
- You may want to have students graph the data individually as well (See Handout 2). Note that Handout 2 has three versions with different scales on the y-axis. The third option allows you to create your own scale.

Bringing the Lesson Home

Have students make connections between the results on the graphs and real world situations to reinforce the patterns experienced. Students can discuss ideas and create different visual representations of how infections spread. All “answers” are intended to be examples only, not definitive responses. Some questions to discuss include:

What does the line on the graph mean? What’s happening?

More people are “getting red.”

Why does the number of people with red squares go up?

Each person that got a red square started coloring in red, too.

Why does the number of people with red squares go flat at the end?

Everyone had a red square at the end.

Let’s pretend that the red squares mean something. What if, when someone colored your square red, they were really giving you the flu? If it was the flu, what were you doing when you colored someone’s square red?

Oh no!

We’re giving them the flu, too!

Change the label on the graph to be “People who are sick.” Show how first just one person was sick, then two people, and so on, until everyone had the flu.

How does the flu spread?

People have germs. If they sneeze or cough without covering their mouths, they can share their germs with others.

What other things spread like the flu? Students may need some additional prompting here.

getting a cold

being kind to others

a new popular toy that everyone wants

Create a stock/flow map showing what affects the number of people infected (Handout 3 and Figure 5 of an example finished map). Note that there are two options for this handout. Option A shows what happened in the game. Option B shows that people can get better after they are sick. The example given is for getting a flu virus, but the context can be different, e.g., number of people who own a particular toy, the number of people being kind. An option is to project

the handout onto a whiteboard or use a document projector, so all students can see as parts are added.

Ask, “What affects the chance of the flu spreading?” Try to get students to share actions that affect this.

<i>washing hands</i>
<i>healthy food choices</i>
<i>cover your mouth</i>

Add one or more elements and arrows to show cause and effect.

What affects whether we come in contact with someone who is sick?

<i>staying home when sick</i>

Add one or more elements and arrows to show cause and effect.

What helps people get better?

<i>getting lots of rest</i>
<i>drinking water and juice</i>

Add one or more elements and arrows to show cause and effect.

How can we use what we learned in our class?

<i>take care of myself</i>
<i>stay home when I'm sick</i>

Add elements and arrows to show cause and effect. (See Figure 5 for an example of a completed map.)

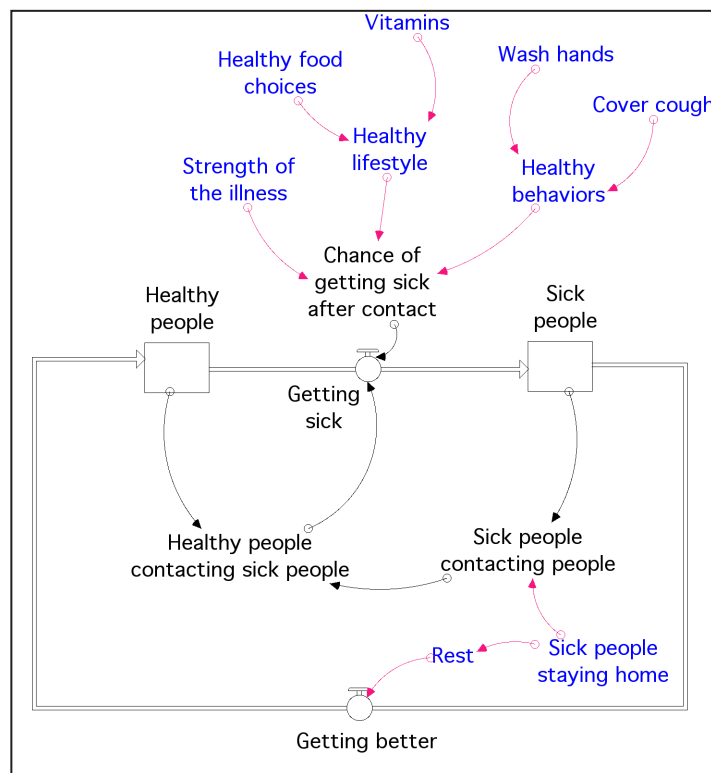


Figure 5: Example Completed Stock/Flow Map

Optional Extensions

- Use “The Infection Game Simulator” to allow students to try different scenarios either as a class (using a projector) or in small groups (using a lab setup). The simulation is free, available online at: http://www.clexchange.org/curriculum/shapeofchange/soc_5_Infection.asp.
- Create a second stock/flow map to show how kindness can spread like an infection. If one person is kind, then that tends to spread.

Acknowledgements

Resources:

Common Core Standards, Common Core State Standards Initiative, <http://www.corestandards.org/>

National Health Education Standards. <http://www.cdc.gov/healthyyouth/sher/standards/>

Six Pillars of Character Education, Character Counts, <http://charactercounts.org/sixpillars.html>

STELLA® used to create stock/flow diagrams. iseesystems.com

The Red and Blue Game

Start

0	Remember – Only use your red crayon if one or more of your squares is red.			
1	2	3	4	5
				6
11	10	9	8	7
12				
13	14	15	16	17

End

