

What's App?

A Series of Free Mini-Lessons to Accompany Four Free Apps

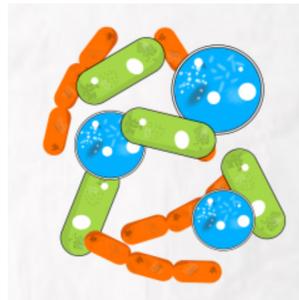
by Anne LaVigne

Some years ago, John Heinbokel and Jeff Potash, two university professors with an interest in teaching key systems dynamics concepts to a wider audience, identified key patterns of behavior that repeated across contexts. They developed a set of simulations that illustrate these contexts and behaviors, so people could explore, ask questions, and look for leverage. Their work became known as the *Demo Dozen*. With advancing technologies, the simulations needed a facelift, so the Creative Learning Exchange (<http://www.clexchange.org>), with partners, the Center for Interdisciplinary Excellence in System Dynamics and BTN (<http://learnwithbtn.com/>), worked together to create the next iteration of the resource.

From the initial dozen, four contexts were selected to be made into simple apps that would tell similar stories and allow the user to do the

same as was originally intended. The apps are easily explored within an hour or less and are written for an audience as young as 4th graders. That's right; yet even adults can learn from these four common scenarios! Thinking back, I wish that I had understood a bit more about planning for retirement. Perhaps I was too bogged down with the reality of inflation... Whatever the case, these apps create a fun, engaging way to explore these situations and hopefully leave users asking themselves even more questions as they think about their futures.

In quick summary:



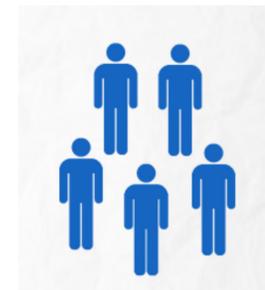
Bacteria Sandwich

- Try *Bacteria Sandwich* to explore how exponential growth can occur when temperature conditions are optimal for the bacteria. Change the initial number of bacteria and temperature to see what happens over 12 hours. Determine how to stop this bacteria before it creates a very dangerous lunch.



'I' in Inflation

- Immerse yourself in *'I' in Inflation* to see how your purchasing power can go up or down, based on the rate of inflation. Change your salary, your annual raise, and the annual inflation rate to see how your financial situation gets better or worse over time.



Population Planner

- Explore *Population Planner* to consider how populations can grow or decline over time. Change the initial population, death rate, and birth rate to see what happens over 100 years. Compare results for different countries and the world.

THIS ISSUE AT A GLANCE

What's App?	1
ST/DM Conference	2
DynamiQueST	4
Splash!	8

What's App? continued on page 3

EDITORIAL

Winter is finally knocking on the door here in the Northeast. We had a very wet spring and a warm, dry summer, combined with a mild fall. Our first real frost wasn't until November, very late for us!

As we edge into winter, the CLE has a lot going on. We are revving up for both DynamiQueST and the ST/DM conference, thus insuring an even busier spring. Put both of these opportunities on your calendar!

We are excited to host another World Climate Simulation at DynamiQueST next spring, certain that the successful simulation last year bears repeating, especially with the current political climate. DynamiQueST will be held on March 16th, again hosted by the System Dynamics group at WPI.

The planning for the 2018 ST/DM conference goes apace, and we encourage you to give us input about what you would like to see happen, or even better, what you feel you would like to share. I always appreciate emails from you. The Systems Thinking and Dynamic Modeling Conference will be held June 29-July 2, again at the Babson Conference Center.

We continue to develop our new *Splash!* software with our partner, BTN. Crowdfunding has contributed a full third of the cost of Version One of the new interactive app, so we are going ahead with it on a fund-as-you-go basis. It is exciting to get started on the real thing after a year of preparation and work by the *Splash!* team.

Don't miss the second two little lessons designed for our fun apps, available on all the app stores for free, as well as downloadable from our website. See our front page overview about using their concepts to create synergy for critical thinking.

We wish all of you a peace-filled holiday season that refreshes and grounds you.

Take care,
Lees (stuntzln@clexchange.org)



2018 Systems Thinking & Dynamic Modeling Conference for K-12 Education

BRING YOUR SKILLS TO THE NEXT LEVEL

JUNE 30–JULY 2, 2018

Babson Executive Conference Center, Wellesley, MA

The Creative Learning Exchange's biennial ST/DM conference provides a unique opportunity for educators, teachers, and administrators. At each of these conferences, world-renowned system dynamicists, systems thinkers, and educators who have been involved in this field for many years join us to share wisdom, information, curriculum, and tips on educating our students for the 21st Century. Both experienced educators and those who are new to system dynamics and systems thinking will find informative and interesting sessions and networking opportunities.

Introductory Workshop

JUNE 29, 2018

Get a jump-start on learning about systems thinking and dynamic modeling! Attend a workshop the day before the conference to increase your systems thinking knowledge. Work with systems mentors—with decades of experience—during hours of introductory content. Make connections to help integrate the stimulating conference material into your classroom.

Keynotes



George Richardson & Anne LaVigne

Brad Morrison & Saras Chung

The CLE is proud to welcome two dynamic keynote pairs to the 2018 conference. With diverse experience in Systems Thinking, Systems Education, and System Dynamics, these four speakers are sure to inform, engage, and motivate us all to educate K-12 students in exciting and powerful ways.

Conference continued on page 12

What's App? Free Mini-Lessons to Accompany Four Free Apps

continued from page 1



Retire Rich

- Experiment with *Retire Rich* to determine implications of different plans to save for retirement. Change annual savings, interest rates, and the timing of saving to see what happens over the course of a lifetime.

Materials

All that's needed are a mobile device and access to one of the stores to download apps. Available for iOS and Android, all four apps are available through iTunes and GooglePlay. Optional handouts are included for each lesson. If only one device is available, an option is to connect that device to a projector (with an adapter) and explore the simulation during a group discussion, for example.

Curricular Connections and Implementation

Each app has strong connections to a variety of curricular contexts and allows for students to see real-world applications of theoretical content, e.g., mathematical formulas. Relevant connections are found within science, math, social studies, and financial literacy.

Each lesson includes a general recommendation for an instructional sequence, but feel free to modify and reorganize these recommendations to fit your particular situation.

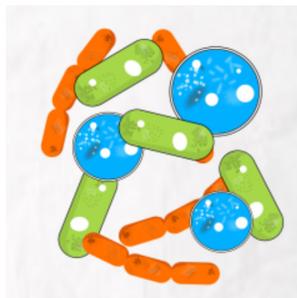
Also included are related resources. When exploring systems, it's easy to see how so many systems are similar, both in their structure and behaviors. Explore these as you wish, realizing that the options are completely open to do as much or as little as makes sense, depending on time available and your curricular goals. Most materials and resources are available from the Creative Learning Exchange website, <http://www.clexchange.org>.

Acknowledgments

Lessons by Anne LaVigne, Creative Learning Exchange, <http://www.clexchange.org>

Demo Dozen by John Heinbokel and Jeff Potash of CIESD

App by BTN, <http://learnwithbtn.com/>



Bacteria Sandwich App – Mini-Lesson

Free download on Google Play or iTunes stores

Overview

Bacteria Sandwich is a free, engaging, easy-to-use app for students and others to explore how exponential growth can occur when temperature conditions are optimal for the bacteria. Students can change the initial number of bacteria and temperature to see what happens over 12 hours. How can this bacteria be stopped before it creates a very dangerous lunch? Students can change the elements to determine how to keep those lunches safe!

Overview

Materials

- Mobile device(s) able to download free apps
- Adapter to connect to projector (if using just one device)
- Handout (optional)

Recommended Ages

4th-12th grade

Time Needed

30-60 minutes

Connections to Curricular Standards

- National Social Studies Theme: III. People, Places, and Environments; and VIII. Science, Technology, and Society
- Common Core Math, CCSS. MATH.CONTENT.7.EE.B.3 Solve real-life and mathematical problems using numerical and algebraic expressions and equations.
- State and national Math standards, See article, "[Thinking Systemically About Common Core Mathematical Practice Standards.](#)"
- Example from Next Generation Science Standards, 3-LS1-1. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

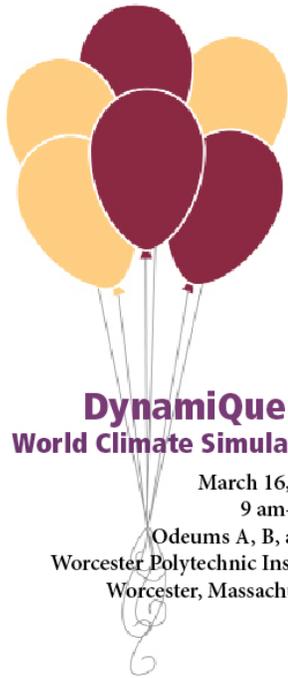
Suggested Instructional Sequence

- Define terms: bacteria, growth factor, and temperature.
- Work through "The Story" in the app, either as a class or independently.

What's App? Lessons continued on page 5

DynamiQueST March 16, 2018

SIMULATIONS FOR REAL-WORLD CHALLENGES



DynamiQueST is a showcase of the power of simulations and creative student projects that utilize critical thinking skills to analyze complex dynamic systems.

JOIN US to play the World Climate Simulation created at MIT and used internationally to facilitate current world climate negotiations.

SEE HOW systems thinking and system dynamics (ST/SD) can elucidate both global issues and curricular content.

What Is Happening In Our Climate Today?

How can countries work together to reduce global warming patterns? **JOIN US** to participate in the World Climate Simulation, an interactive simulation built on the same model the Paris Climate Summit used to create the Accord. At **DynamiQueST**, middle and high school students and their teachers will work together to chart a course to reduce emissions. Framed by employing current climate change science and a computer model, you will see the effect of your proposed policies in real-time.

Who Will Be There?

Students (ages 12-18), teachers and parents will participate in the simulation and utilize critical thinking tools to analyze strategies and communicate their ideas. Expert teachers will facilitate the simulation.

How Do I Know If DynamiQueST Will Fit My Students?

Do you and your students want to delve deeper into real-world challenges such as Climate Change? NO experience needed!



And There's More...

DynamiQueST also showcases student projects that explore complex social problems like the opioid epidemic and the destruction of the cod fishing industry. You'll hear directly from the students as they share their understanding from using tools that helped them develop their skills in

- Critical thinking
- Navigating dynamic complexity (when cause and effect are separated by time and space)
- Communicating effectively
- Understanding balancing and reinforcing feedback processes.

Schedule For The Day

9-11:30 – World Climate Simulation.

11:30-12:45 – Lunch and talking with students about their poster presentations

12:45-2:00 – Debrief of World Climate Simulation

What Are The Goals Of DynamiQueST?

- Experience the World Climate Simulation, based on a system dynamics model, and used around the world to understand the issues surrounding climate change
- Apply practical critical thinking tools to a real-world problem
- See student projects that embody critical thinking using systems thinking and system dynamics (ST/SD)
- Showcase student work for the wider community
- Meet students from other communities
- Have some fun and celebrate with kids!

How Do I Sign Up?

- Register at the CLE website <http://www.clexchange.org/news/dynamiquest/> or email the director, Lees Stuntz.
- All students and teachers are welcome. Cost for the day: \$25 per person, including lunch. Bring a full car - \$100 for 5 participants. (<http://www.clexchange.org/news/dynamiquest/>)
- Students wishing to present a project should email Lees Stuntz at stuntzn@clexchange.org

JOIN US ON MARCH 16, 2018!

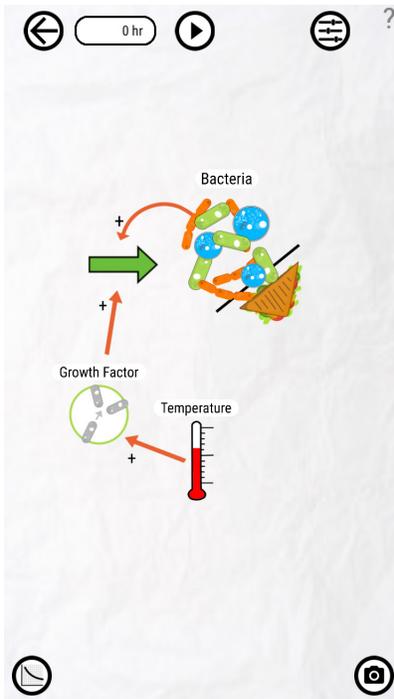
What's App? Lessons - *Bacteria Sandwich*

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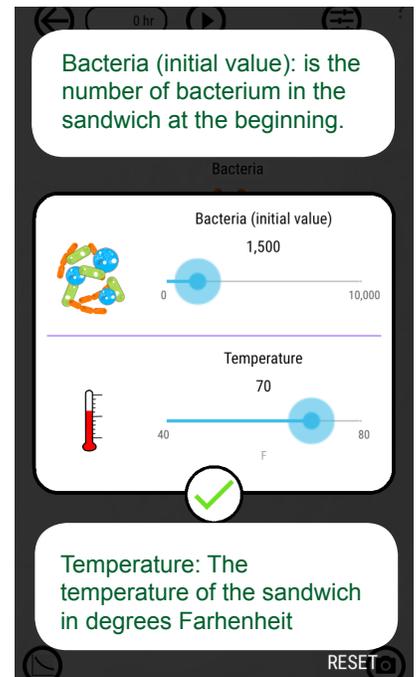
- Pause and discuss strategies to prevent the bacteria from growing to dangerous levels.
- Using the handout, continue experimenting with “The Model” to consider different scenarios for controlling the level of bacteria.
- Discuss students’ reflections from their handouts.
- Extend the exploration using the optional extension on the handout to look at potential leverage for preventing illness from tainted food.
- Discuss questions such as:
 1. What kinds of strategies, or even new inventions, might prevent your sack lunch from becoming tainted?
 2. What other undesirable elements grow like the bacteria? What could prevent them from growing?

Additional Ideas and Connections

- Algebra I or II: Use the model with resulting graphs to explore the concept of exponential growth and the underlying equation.
 1. For $y = a(1 + r)^x$ with (a) being the initial number of bacteria and (r) being the growth factor. For example, at 50° F, the growth factor is 0.05.
 2. Calculate the number of bacteria (y) at time (x).
 3. In addition, you can give students the initial and ending values of bacteria so students can calculate the growth factor (r).



Bacteria Sandwich Model Screen



Bacteria Sandwich Controls (sliders)

- Surface, practice and discuss related mathematical practices.
 1. Make sense of problems and persevere in solving them.
 2. Reason abstractly and quantitatively.
 3. Construct viable arguments and critique the reasoning of others.
 4. Model with mathematics.
 5. Use appropriate tools strategically.
 6. Attend to precision.
 7. Look for and make use of structure.
 8. Look for and express regularity in repeated reasoning.
- Extend student learning with one or more of the optional related resources.

Related Curricular Resources

See the Creative Learning Exchange website to download lessons, purchase materials and access additional online simulations for:

The Shape of Change – The Infection Game, an exploration of a pattern of infection, initially exponential. Book available from the CLE at <http://www.clexchange.org/cleproducts/shapeofchange.asp>

Dollars and Sense, a series of lessons and simulations that explore patterns with money. Some lessons look at the accumulation of credit card debt, similar to bacteria reproducing over time. Book available from the CLE at <http://www.clexchange.org/curriculum/dollarsandsense/default.asp>

Model Mysteries, Chapter 1, Growing, Growing, Gone, a lesson to build your own model to explore a population of

What's App? Lessons continued on page 6

What's App? Lessons - Bateria Sandwich

continued from page 5

zombie chickens growing in a similar pattern to bacteria in a sandwich. Book available from the CLE at <http://www.clexchange.org/curriculum/modelmysteries/>

Food Safety Articles: https://www.fsis.usda.gov/wps/portal/fsis/topics/food-safety-education/get-answers/food-safety-fact-sheets/safe-food-handling/danger-zone-40-f-140-f/ct_index

Food Technology & Processing - Bacterial Food Poisoning, by Al B. Wagner, Jr., Professor and Extension Food Technologist
<http://aggie-horticulture.tamu.edu/food-technology/bacterial-food-poisoning/>

Acknowledgments and Sources

- Lesson by Anne LaVigne for the Creative Learning Exchange, <http://www.clexchange.org>
- App by BTN, <http://learnwithbtn.com/>
- Potash, Jeff, *Thinking Systemically About Common Core Mathematical Practice Standards*. http://static.clexchange.org/ftp/documents/implementation/IM2014_CommonCoreMath.pdf
- National Social Studies Standards, <https://www.socialstudies.org/standards/strands>
- Next Generation Science Standards, <https://www.nextgenscience.org/standards/standards>

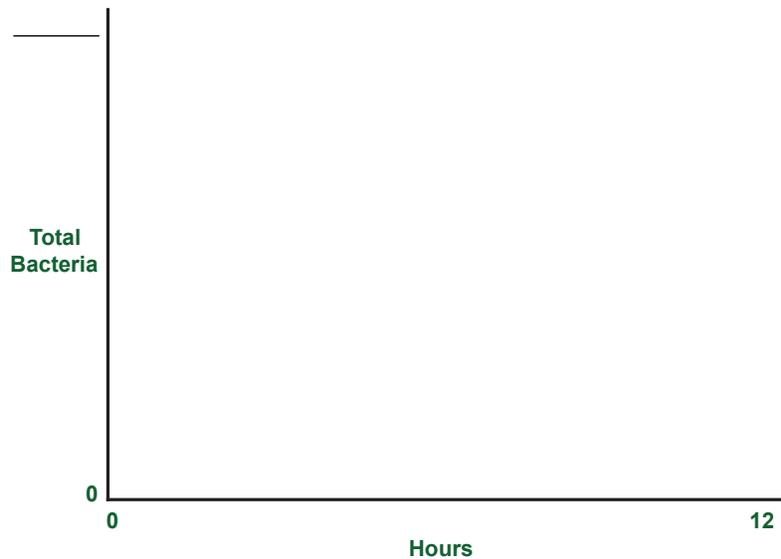
Bacteria Sandwich handout

Name: _____

Bacteria: _____ Temperature: _____
(initial value)

Label and draw two runs on the graph – one that shows the bacteria number growing too large and one that shows the number staying low enough to be safe for consumption.

Bacteria in the Sandwich



Reflection

What worked best and was also realistic to prevent the rise of bacteria to an undesired level?

What other situations could you study using this app?

Extension

Instructions

Read the article excerpt below from *Food Technology & Processing - Bacterial Food Poisoning* by Al B. Wagner, Jr., Professor and Extension Food Technologist <http://aggie-horticulture.tamu.edu/food-technology/bacterial-food-poisoning/> and use the article and simulation to complete the handout.

“Foodborne illness is an ever-present threat that can be prevented with proper care and handling of food products. It is estimated that between 24 and 81 million cases of foodborne diarrhea disease occur each year in the United

States, costing between \$5 billion and \$17 billion in medical care and lost productivity.

“Chemicals, heavy metals, parasites, fungi, viruses and bacteria can cause foodborne illness. Bacteria related food poisoning is the most common, but fewer than 20 of the many thousands of different bacteria actually are the culprits. More than 90 percent of the cases of food poisoning each year are caused by *Staphylococcus aureus*, *Salmonella*, *Clostridium perfringens*, *Campylobacter*, *Listeria monocytogenes*, *Vibrio parahaemolyticus*, *Bacillus cereus*, and Enteropathogenic *Escherichia coli*. These bacteria are commonly found on many raw foods. Normally a large number of food-poisoning bacteria must be present to cause illness. Therefore, illness can be prevented by (1) controlling the initial number of bacteria present, (2) preventing the small number from growing, (3) destroying the bacteria by proper cooking and (4) avoiding re-contamination.

“Poor personal hygiene, improper cleaning of storage and preparation areas and unclean utensils cause contamination of raw and cooked foods. Mishandling of raw and cooked foods allows bacteria to grow. The temperature range in which most bacteria grow is between 40 degrees F (5 degrees C) and 140 degrees F (60 degrees C). Raw and cooked foods should not be kept in this danger zone any longer than absolutely necessary.

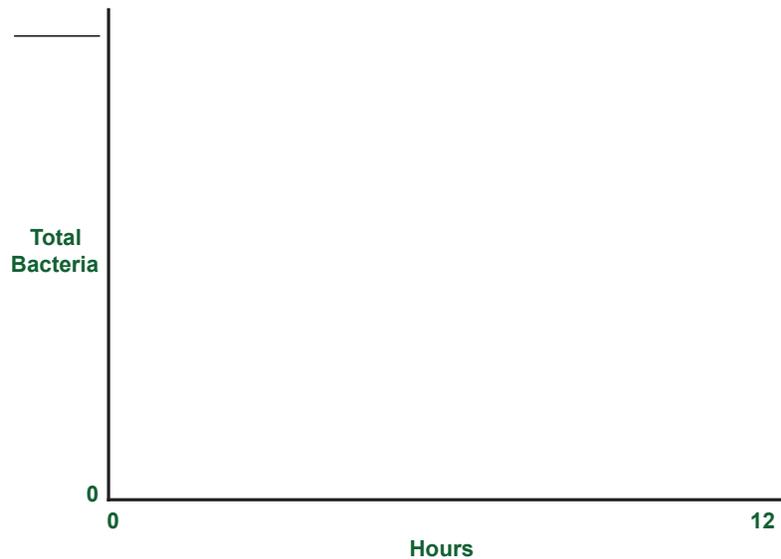
“Undercooking or improper processing of home-canned foods can cause very serious food poisoning. Since food-poisoning bacteria are often present on many foods, knowing the characteristics of such bacteria is essential to an effective control program.”

Initial Bacteria—Considering the Initial Number of Bacteria

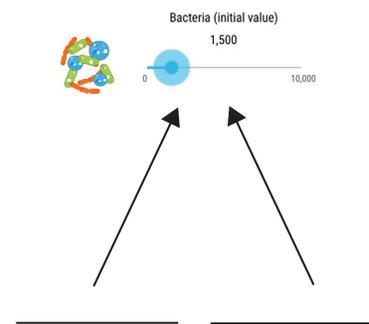
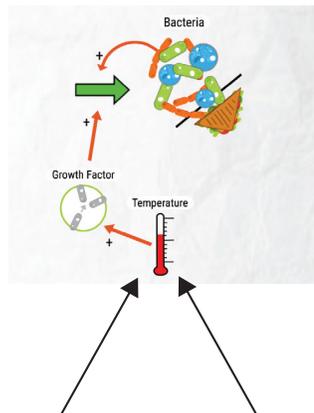
What strategies can people use to keep this number low initially?

Determine: How many bacteria to begin with are too many? Experiment with the simulation to see if you can prevent the problem by starting with a lower number of bacteria. Show and describe one example of what you did that works.

Bacteria in the Sandwich



Using the diagram from the simulation, add at least two ways to affect the initial number of bacteria and two ways to affect the temperature.



What's App? Lessons continued on page 9

Splash! A Free, Mobile App With A New Way To Think About How Things Work

Liquid Physics + System Dynamics = *Splash!*



Kids love to play and figure out how things work. They explore their world and create ways to share their understanding wherever they are. These kids create drawings to show how the health of the school's garden can grow and decline over time.

"Any fool can know. The point is to understand."

-Albert Einstein

Will you join us to provide a tool to students to increase understanding?



First Graders Exploring Garden Health

Such drawings are useful, yet they are static, unable to move and actually change over time. How can we create a new way for kids to play and think—an engaging space where they can explore, create and test their ideas within a moving playground?

https://www.youtube.com/watch?v=_ENdMhOZNgg&index=2&list=PLCr1xN-aRPae8JsQsbt8_5P-y32hflnc

The *Tubs and Pumps* activity, developed by Chris Browne, Barry Newell and Katrina Proust, was a stepping stone to *Splash!*

"Tell me and I forget, teach me and I may remember, involve me and I learn."

-Benjamin Franklin

Will you join us to help involve students in their own learning?

Physical simulation with containers and pumps is one way to learn about how "stuff" of this world changes over time. *Splash!* provides a new kind of space for kids to play. Kids can build moving models of how their world works. It empowers them to generate their own learning and to find their own solutions. It's also strongly connected with curricular goals as well, so integration into classroom instruction can bring alive concepts related to STEM, for example.

An Introduction to *Splash!*

https://www.youtube.com/watch?v=uLtzhKUyUec&index=3&list=PLCr1xN-aRPae8JsQsbt8_5P-y32hflnc

Let's build this playground, so anyone—whether young or not so young—can explore and learn in this new way. We're giving the app away to everyone, everywhere, with no advertising, thus removing barriers to implementation for cash-strapped school systems throughout the world.

Join this worldwide group of concerned citizens to give our youth a tool to engage their minds and inspire them to build better futures for themselves and the generations to come.

Let's increase understanding...

Let's involve students in their learning...

Let's kindle the flame of inspiration and innovation...

To see more demonstration videos, design documents, and benefits on the *Splash!* webpage, go to <http://www.clex-change.org/splash/> and the *Splash!* YouTube Playlist https://www.youtube.com/watch?v=cFH45qWwJxU&list=PLCr1xN-aRPae8JsQsbt8_5P-y32hflnc.

"Education is the kindling of a flame, not the filling of a vessel."

-Socrates

Will you join us to help kindle the flame?



What's App? Lessons - *Bacteria Sandwich and 'T' in Inflation*

continued from page 7

Describe the elements in your diagram and how they impact one another.

What recommendations would you make to a school cafeteria to make sure food is safe to eat?



'T' in Inflation App – Mini-Lesson
Free download on [Google Play](#) or [iTunes stores](#)

Overview

'T in Inflation' is a free, engaging, easy-to-use app for students and others to explore the relationships among wages, inflation, and a potential gap in spending power over time. Students can change the initial salary they're earning from their first professional job. They can also adjust the rate at which they'll receive raises and the rate that inflation occurs. By considering these rates, it becomes more evident whether or not the offered salary is enough to survive on over the long run.

Suggested Instructional Sequence

- Define terms: annual raise, annual inflation, salary and price.
- Work through "The Story" in the app, either as a class or independently.
- Pause and discuss strategies to maximize your financial worth in the long run.
- Using the handout, continue experimenting with "The Model" to consider different scenarios.
- Discuss students' reflections from their handouts.
- Consider causes of low vs. high inflation and how you as a consumer might change your buying behavior.
- Discuss questions such as:
 1. What strategies could you use to improve your financial situation?
 2. What financial choices could you make to avoid overspending the amount of money you have?

What's App? Lessons continued on page 10

Overview

Materials

- Mobile device(s) able to download free apps.
- Adapter to connect to projector (if using just one device)
- Handout (optional)

Recommended Ages

4th-12th grade

Time Needed

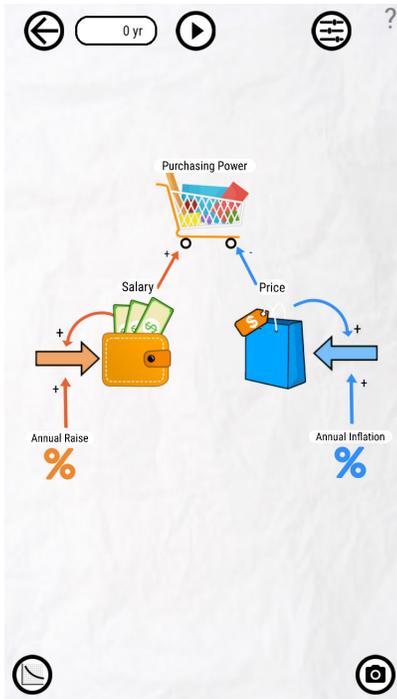
30-60 minutes

Connections to Curricular Standards

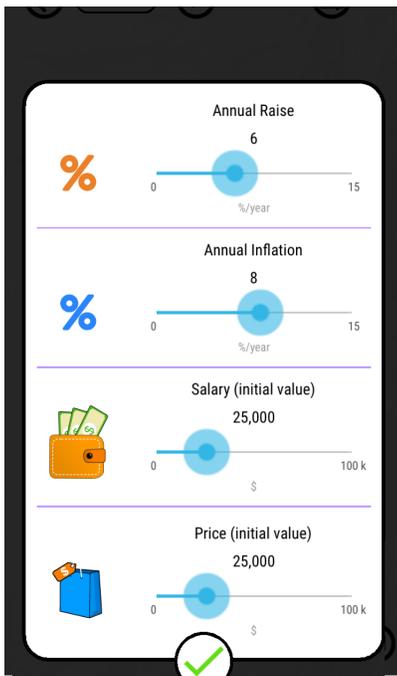
- Common Core Math, CCSS. MATH.CONTENT.7.EE.B.3 Solve real-life and mathematical problems using numerical and algebraic expressions and equations.
- State and national Math standards, See article, "[Thinking Systemically About Common Core Mathematical Practice Standards.](#)"
- National Financial Literacy Standards
"The standards contain areas of knowledge and understanding that are fundamental to personal finance, including earning income, buying goods and services, using credit, saving, financial investing, protecting and insuring.
- ... the mathematics of saving is covered, including the power of compound interest.... At the 12th grade level, more complex concepts are introduced, such as ... saving for retirement."

What's App? Lessons - 'T' in Inflation

continued from page 7



'T' in Inflation Model Screen



'T' in Inflation Controls (sliders)

Annual Raise: The percent your salary will go up each year

Annual Inflation: The percent that the cost of goods and services will go up each year

Salary: How much money you earn when you are first hired

Price: How much all the goods and services you buy each year cost when you are first hired

Additional Ideas and Connections

- Surface, practice and discuss related mathematical practices.
 1. Make sense of problems and persevere in solving them.
 2. Reason abstractly and quantitatively.
 3. Construct viable arguments and critique the reasoning of others.
 4. Model with mathematics.
 5. Use appropriate tools strategically.
 6. Attend to precision.
 7. Look for and make use of structure.
 8. Look for and express regularity in repeated reasoning.
- Extend student learning with one or more of the optional related resources.

Related Curricular Resources

See the Creative Learning Exchange website to download lessons, purchase materials and access additional online simulations for:

Dollars and Sense, a series of lessons and simulations for elementary through high school students that explores patterns with money. Book available from the CLE at <http://www.clexchange.org/curriculum/dollarsandsense/default.asp>

Model Mysteries, Chapter 1, Growing, Growing, Gone, a lesson to build your own model to explore a population of zombie chickens growing in a pattern similar to dollars going up or down in a bank account. Book available from the CLE at <http://www.clexchange.org/curriculum/modelmysteries/>

Investigate definitions and explanations of inflation. For example, *Social*

Studies for Kids, <http://www.social-studiesforkids.com/articles/economics/inflation1.htm>

Read current articles about the impacts of inflation on the economy. For example:

- *What are the Effects of Inflation on the Economy? Understanding How Inflation Helps and Harms Investors and Consumers* at <https://www.thebalance.com/what-are-the-effects-of-inflation-357607>
- *How Does Inflation Impact My Life? Impact on You and the Economy, Why President Reagan Said "It's as Violent as a Mugger"* at <https://www.thebalance.com/inflation-impact-on-economy-3306102>

Acknowledgments and Sources

- Lesson by Anne LaVigne for the Creative Learning Exchange, <http://www.clexchange.org>
- App by BTN, <http://learnwithbtn.com/>
- Potash, Jeff, *Thinking Systemically About Common Core Mathematical Practice Standards*. http://static.clexchange.org/ftp/documents/implementation/IM2014_CommonCoreMath.pdf
- Common Core Math Standards, <http://www.corestandards.org/Math/>
- National Financial Literacy Standards, <http://councilforeconed.org/>

'I' in Inflation handout

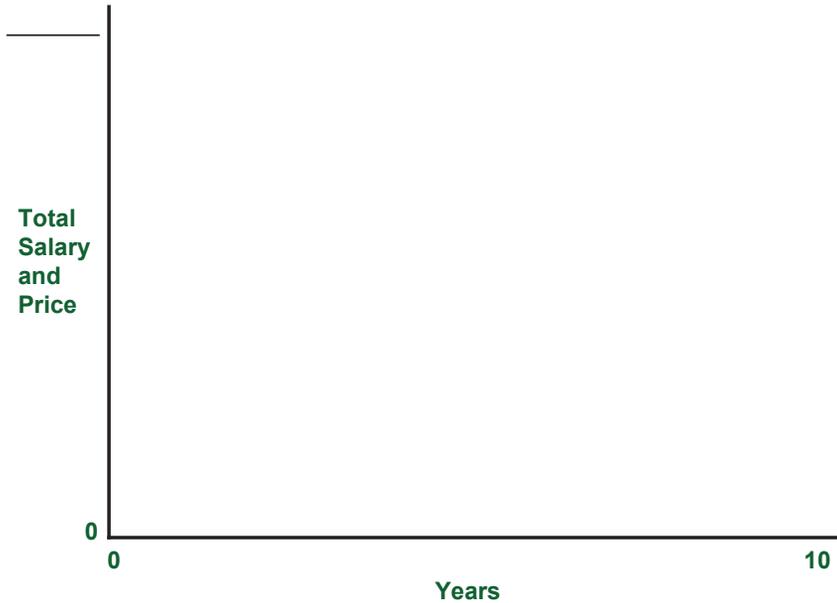
Name: _____

Run 1:

Salary: _____ Annual Raise: _____
(initial value)

Label and draw a run on the graph that shows a problem (a gap) in how much money you make in comparison to how much you need to spend.

My Financial Situation

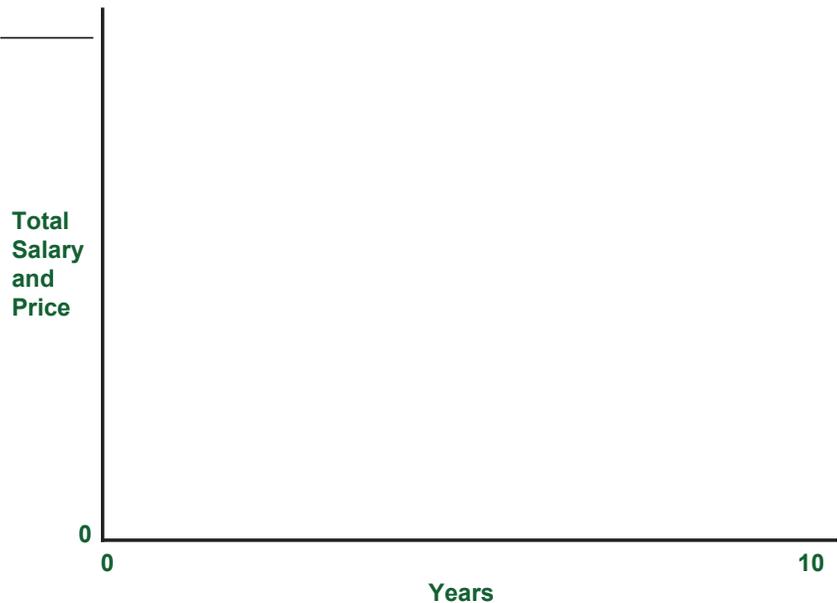


Run 2:

Salary: _____ Annual Raise: _____
(initial value)

Label and draw a run on the graph that shows one way to fix the problem (gap) in how much money you make in comparison to how much you need to spend.

My Financial Situation



Reflections

Run 1: What happened to your spending power over time? Why?

How can you reduce or eliminate the gap, so your buying power stays the same or goes up?

Run 2: What happened to your spending power over time? Why?

How did you reduce or eliminate the gap, so your buying power stays the same or goes up?

Given what you learned, how will your new understanding of inflation affect your own financial decisions?

ST & DM Conference for K-12 Education

continued from page 2

PRESENTATIONS & REGISTRATION

The CLE is currently accepting applications for presenting at the 2018 ST/DM Conference. If you would like to take advantage of this unique opportunity, please email Lees Stuntz for more information.

Integrating the Learning Environment for both students and teachers requires more than K-12 education as usual. It requires using techniques and tools that give students deeper understanding through multiple avenues for learning. System Dynamics and Systems Thinking provide such strategies for exploring complexity, interconnectedness, and change over time.

- Workshops with hands-on learning
- Interactive plenary presentations
- Demonstrations of student work and student leadership
- Ample opportunities for informal networking

Register for the conference today!

The conference will run from registration, starting at 8:30 Saturday morning, June 30, to noon on Monday, July 2.

The Introductory Workshop will run all day Friday, June 29, and throughout the conference.

Scholarship applications for educators are available on the [website](#).

Interested In Investing?

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The Creative Learning Exchange works to develop Systems Citizens in K-12 education who use systems thinking, system dynamics, and an active, learner-centered approach to meet the interconnected challenges that face them now and in the future. It is a non-profit educational institution and all contributions to it are tax deductible.