

Germs

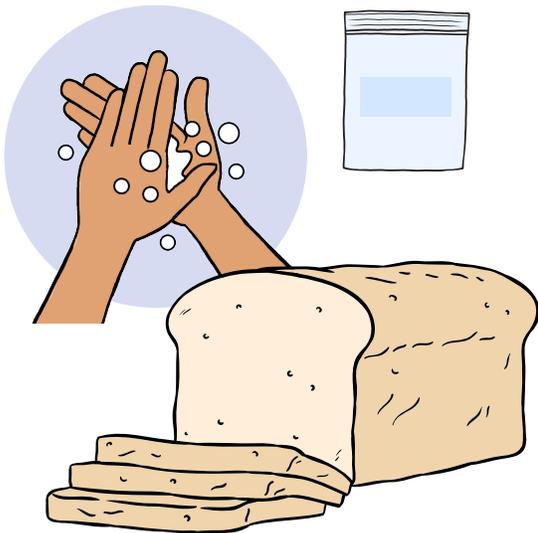
On *Today, Explained*, we learned all about how we contract the coronavirus and how to conduct experiments. For this activity, we put the two topics together!

The Centers for Disease Control and Prevention says that washing your hands for 20 seconds can stop the spread of the coronavirus. But what happens if we wash for 10 seconds? Are there fewer germs if we wash for a minute? Does it matter if we use hot or cold water? What about if we just use hand sanitizer? You may have seen mold on old bread before. In this experiment we are going to see whether certain conditions can cause more mold to grow on bread - or less!

Materials Needed:

- 8 sealable sandwich bags,
- 4 slices of bread (cut in half)
- soap
- hand sanitizer
- marker
- paper

Time: 7-14 days



Step 1: Prepare Samples

In order to achieve the most accurate results, we first need a control group. Wash your hands for 20 seconds with soap and water, then shake to air dry. Put a sealable bag next to your work space, ready to be used. Trying your best not to touch the bread all over, carefully take out four slices of bread and, using a clean butter knife on a clean surface, cut each slice in half. Place one half slice directly in a clean sandwich bag and seal. This will be the slice of bread we will compare with the other samples.

Using a marker, label the bag: **Control**

Now let's get our hands dirty!

To ensure that you have the same amount of dirt on your hands each time, we need to create the same conditions. Below are six activities. Make sure to **get your hands dirty the same way each time.**

This will ensure fewer variables!

- Tie and untie your shoes
- Touch the toilet flusher for 5 seconds
- Touch a cellphone screen for 5 seconds
- Turn the bathroom door knob inside the bathroom
- Open and close the refrigerator door
- Touch all the buttons on the television remote

With your hands **dirty**, take one of the half slices of bread and rub it all over your hands (make sure to get between those fingers). Try not to tear the bread. Place the bread in a bag and seal.

Label the bag: **Unwashed.**



Wash your hands for 20 seconds using soap and warm water. We have to make sure we have all the bread crumbs off. Remember we need to keep all the conditions the same if we want to have an accurate result.

Wash your hands for 20 seconds with soap and warm water. Shake to air dry. Take another half slice of bread and rub it all over your hands (the same way you did for the unwashed sample). Place it in a bag and seal.

Label the bag: **20 seconds/warm**

Wash your hands for 10 seconds with soap and warm water. Shake to air dry. Take another half slice of bread and rub it all over your hands. Place it in a bag and seal.

Label the bag: **10 seconds/warm**

Wash your hands for 20 seconds with soap and cold water. Shake to air dry. Take another half slice of bread and rub it all over your hands. Place it in a bag and seal.

Label the bag: **20 seconds/cold**

Wash your hands for 10 seconds with soap and cold water. Shake to air dry. Take another half slice of bread and rub it all over your hands. Place it in a bag and seal.

Label the bag: **10 seconds/cold**

Wash your hands for 1 minute with soap and warm water. Shake to air dry. Take another half slice of bread and rub it all over your hands. Place it in a bag and seal.

Label the bag: **1 minute/warm**

Using only hand sanitizer, clean your hands for 20 seconds. Take the last half slice of bread and rub it all over your hands. Place it in a bag and seal.

Label the bag: **hand sanitizer**

With the experiment complete, tape each of the bags to the wall. They will be there for the two weeks of the experiment so ask your adult for the best wall to use.

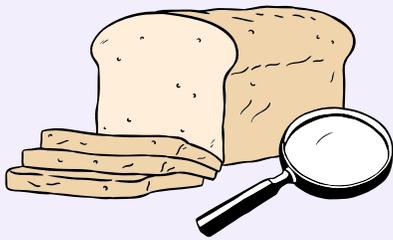
Step 2: Make a Prediction

Based on your prior knowledge, what do you think will happen to each of the slices of bread? Will they look the same? Different?

Step 3: Observation

Every day, check on the bread (do not remove it from the bags).

Make notes on the color, the size, and the texture. Hint: Use the chart to help identify what you see!



White: Sclerotinia sclerotiorum mold

Pink: Serratia marcescens bacteria

Yellow: Aspergillus mold

Greenish-blue: Penicillium digitatum

Blue: Penicillium crustosum

Step 4: Form a Conclusion

What happened? Was your prediction right? Did the results surprise you?

Bonus Activity:

Get the entire family involved! Have each person use their own 8 half-slices of bread and see what happens. Are the results the same? Are they different?

Discussion Guide

The discussion guide below is designed to encourage families and educators to extend the scientific inquiry process to social issues. Specifically, we'll explore the concepts of **E²R²: Equality, Equity, Risk, and Resilience**. Just as before, it's all about open-minded observation, asking questions, making predictions, and challenging conclusions. And no, we haven't forgotten about your bags and mold! By the end, you'll see that **E²R²**: goes great with sliced bread!

Let's meet E²

At first glance, the words Equality and Equity seem pretty similar (there's only a 2-letter difference, right?). But if we dig in a bit, we'll see that they refer to slightly different concepts:

Equality is generally about equal opportunity and giving everyone the same things in order to enjoy full, healthy lives.

Equity goes a step further by understanding people's different needs and providing specific things in order to enjoy full, healthy lives

There are dozens of images describing the equality-equity relationship, and the one Carol Bryan of Corvallis, Oregon, drew when she was 14 is one of our favorites.

<https://mmt.org/news/equity-illustrated-youth-winner-everyone-has-voice>

"Like equity, equality aims to promote fairness and justice, but it can only work if everyone starts from the same place and needs the same things."

—Annie E. Casey Foundation

Equality and equity really are closely related by so much more than spelling!

So, what do you think about E²? What are your hunches on how this is going to tie back to the bread-and-bags experiment?

Let's meet R²

Next up: **Risk and Resilience!** Though they don't have much in common as far as spelling is concerned, these two words are also super important to understand what's needed to enjoy full, healthy lives.

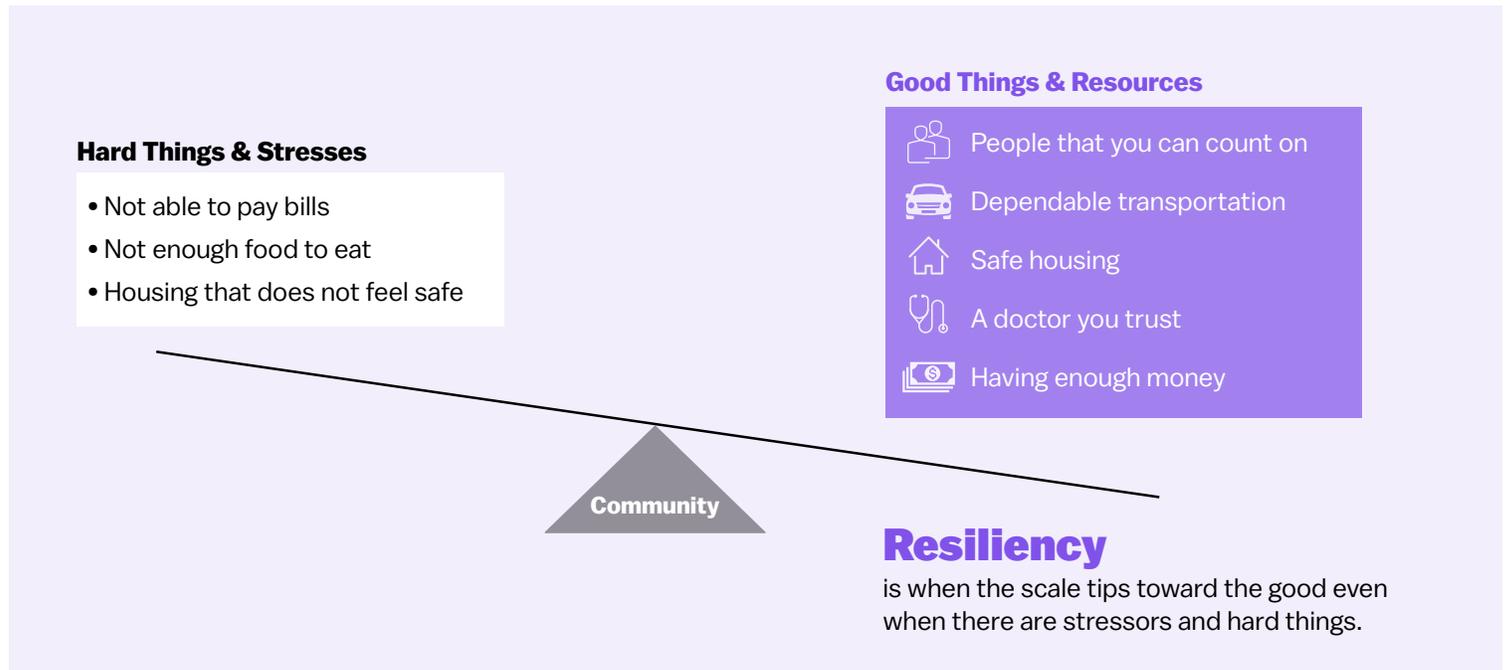
Risk factors are things in a community or society that cause stress and make it difficult for families and neighbors to thrive.

Resilience is the process of how communities and families adapt to stress or "bounce back" from it, especially when experiencing stresses over and over.

Unfortunately, there's a wide range of risk factors in our communities, from limited options for playgrounds and greenspace to lacking grocery stores and access to doctors and hospitals. Add to this a host of "-isms" like racism, sexism, and ageism, and this half of R² might start to feel heavy.

However, it can be really helpful to picture risk and resilience as a balancing act, with hard things (stresses) on one side and good things (resources) on the other.

R² Scale Adapted from graphic by Frameworks Institute and The Buncombe ACE (Adverse Childhood Experience) Learning Collaborative



In other words, resilience is when the scale tips toward the good, even when there are stresses and hard things.



What hard things and what good things would you put on a scale for your neighborhood, town, or country right now? Draw them in boxes and let's see how your "R² scale" stacks up!

Can we get messy again!?

Absolutely! Like that super gnarly rainbow-colored mold from earlier, stick with us.

By the way, are your hands fresh and clean right now? Like so fresh and so clean *clean*? Great! Let's leave the funk in the trunk and get "virtually messy" by using the bread and bags as a way to keep exploring E^2R^2 .



Going forward, the bags represent society.

Society is the institutions around us as well as the cultural ideas, relationship networks, and political processes. "Society" is pretty hard to describe because we can't see it, kind of like the air in a bag.



The bread represents communities.

Unlike the air in the bag and unlike society, community is something you can see and touch. Community refers to a group of people who share a physical space and often some common beliefs or values. Even though the size of a community can be small (like a village) or large (like a nation), the size of a society is always larger.

Yup, bags = society.

Bread = communities.

So let's explore some different social conditions and make some predictions, the same way you made predictions about the bread slices before you started the bread-in-bags experiment. As you move through the different conditions, keep thinking of possible real-world examples.

- 1** How could things change if you start with all your bags on the counter, but then on day 3 you move half to a sunny windowsill and put half in a cool cabinet? What E^2R^2 factors are at play?
- 2** Over 7 days, you check on half the bags 3 times each day and spend 3 minutes observing them each session. You glance at the remaining bags once every 3 days for maybe 30 seconds, if you're not busy. If asked to list risks and resiliencies about each group, how might it go? Why?
- 3** Imagine exposing your bread to additional variables (touch handle of cat litter scoop, touch mailbox, touch floor). Which R^2 is increasing? Which E^2 approach seems most relevant?

Now that we've explored *these* bags, it's time for you to dream up brand new bags!

What are some ideal bag conditions? In other words, what's needed to help all this bread enjoy full, healthy lives?

For hints, see the list of 40 human rights in the United Nations Convention on the Rights of the Child.

<https://www.unicef.org/child-rights-convention/convention-text-childrens-version>

There's even a super-cool printer-friendly kids version.

<https://www.unicef.org/media/60981/file/convention-rights-child-text-child-friendly-version.pdf>

Wait a second. We've been having this whole conversation focused on just one type of community. Let's shake up the bread basket!

You can repeat this entire experiment with another type of bread.

How do the results change when you use:

- multigrain
- wheat
- challah
- pita
- tortilla
- brioche
- white
- bagel

You can also repeat the virtual experiment using different "bread" and different "bags," too! How might E^2R^2 differ when the "bread" is a community different from your own, perhaps one without sidewalks, or a police station, or a nearby school? Imagine a "bag" completely different than ours, perhaps a society that limits the internet, or one that has universal healthcare or free college?

From germs and handwashing to bread and bags, from equality and equity to risk and resilience, you just packed in a lot. We're so excited that you strengthened your scientific inquiry skills and applied them to current issues in our communities and society. Don't stop here, let's keep it going. What color mold did you end up with? What boxes did you draw on your R^2 scale? Which new bags did you dream up? Please snap pictures of your activities and share your experience on Twitter and Instagram with #TodayExplainedLearning. Can't wait to see you next month for more *Today, Explained to Kids!*