6th grade: Savings TOMATO Seeds Lesson

objective: learn about the importance of seed saving (maintaining genetic diversity) and germination inhibitors by learning how gardeners properly save tomato seed.
supplies : cutting knives, paper plates, cups, plastic spoons, tomatoes
time: 45 min - hour

brief intro: Why is this a good time of year to discuss seeds? Look around – what have plants been doing in garden all summer? Flowers – pollination – seed production – now it's fall and we can find and SAVE seeds!

WHY save seeds? 5 min

If you're a gardener it can be

1) cheaper than buying seed – **it's FREE!**
2) you can **create new varieties!** select seed from plants that grow well in your garden and if you do this over many years you are creating your own 'varieties' and shaping the genetics of a plant! This is historically how people created different varieties and manipulated nature – you can even cross pollinate specific plants by hand pollinating and functioning as the honey bee or butterfly and thereby create totally new varieties of plants! OR you can nudge nature in one direction by selecting seed from a plant that grew in a weird way and was a genetic freak or abnormality
3) you can help **preserve genetic diversity** for the environment! Why is genetic diversity important to environment? Ever hear of the Irish potato famine which starved millions of people? Why did all the potato plants die? Because they were only one variety and one disease killed them ALL. If they'd had many different varieties maybe the disease would only have affected some of the potatoes – this is why it is extremely important to maintain genetic diversity. It's so important that the US and Russia have seed storage vaults deep underground where it's very cold and they can keep seeds from all over the globe dormant - they are preserving genetic diversity for the future. It was so important that Russian scientists during WWII were willing to DIE for seeds. They locked themselves into the seed vault in Leningrad to prevent Nazis from coming in and looting – they could have survived and eaten the grain seeds in the vault but instead they chose to starve to death to save the seed, knowing someday that the seed diversity in the vault might help save their people and the world's population from dying of mass famine…

***expansion: show students the picture of the tiny wild tomato ancestor scientists are trying to save to preserve genetic diversity; send article back to class with Wick to read later?*

Let's look at tomato seeds 15min

Visit Wick's class bed – look at tomato fruits falling – what will happen to these fruit if we don't pick them? They'll rot. Is this good or bad for the plant? It's a good thing for the seeds! Why? Because before a tomato seed can germinate it needs to overcome a chemical dormancy that blocks seed germination. It actually should rot! Why would it want to block its own seeds from germinating? So they don't germinate too quickly – like inside the fruit! Ever opened an orange and seen a sprouting seed inside the fruit?!

And if you're a gardener or farmer collecting your own seed, you need to know the right way to save seeds from specific plants because seeds evolved to have special types of dormancy to prevent them from germinating too early or under conditions that are not good for the plant to grow.

5 Types of seed dormancy:
Physical – hard, thick seed coat prevents water from entering (requires scarification/cracking into it to allow water in)
Physiological – life processes of the embryo inside is delayed until sth triggers development (like light – which will initiate biochemical response in embryo to start developing/maturing)
Morphological – embryos inside need more time, not fully developed
Mechanical – the covering surrounding the seed prevents embryo from expanding (like wings on maple 'helicopter' seeds have to first age/crack open)
Chemical – chemicals block germination –must be washed away or inactivated (through fermentation or digestive tract of an animal or lots of water)
* some seeds have multiple dormancy mechanisms!

What would happen if these rotting tomatoes germinated right NOW – would they survive winter?! NO. Maybe in their native climate (South America) because there they are perennials but here they are annuals.

****expansion:** science of seed saving - What are heirloom varieties? What does it mean to 'grow true' from seed? What are F1 hybrid seeds? Why will these NOT grow true from seed saved?*

Seed Saving 10 min

1. Students work in pairs to each harvest one paste tomato – remind them to pick good looking, healthy fruit!

2. They label a cup with both their names

3. They slice tomato lengthwise in half (like a boat) with a knife then scoop out the seeds with pulp/slime into plastic cup. They can add a little water to just cover the seed

4. **pre-prepare a moldy cup to bring in and show them how to strain/dry seeds Explain that they must leave the cups in a dark part of classroom for 3-5 days to mold over and get slimy – this is a **process called Fermentation** - then they scoop off top layer of mold and any floating seeds (these are not viable, seeds that sink are healthy seeds! Rule of thumb) and the strain the good seed through a sieve and rinse them off. Put seed on a paper plate (NOT paper towel) to dry thoroughly. Put in envelopes (make origami seed packets?!) and save in a cool place. Sow in greenhouse in early spring!

Expansion: experiment – Mr. Wick can scoop out seeds with goop and let dry directly on the plate, no fermenting involved! Once these dry and the other seeds have dried, try germinating each in cups and see which seeds sprout!

Make a snack from leftover flesh of tomato! 10-15 min

What should we do with the leftover flesh of the paste tomato? EAT it!!

These are paste tomatoes – why grow them? For making sauce – more flesh than seed – compare by cutting into a slicing tomato, grape or cherry tomato, which is more water than pulp etc.

Garden is full of edibles – make a tomato boat snack! –be a chef and choose your own flavor combination! Do you like sour tastes? Peppery? Mild?

Students search the garden for their own edibles to layer into the tomato boats - layer in a leafy **herb,** or an edible **flower** like nasturtiums, or a sour Mexican mini gherkin or a green bean **(fruit)**?! Or some mustard or dill **seed**? Or a **weed** like purslane?

Herbs
Basil (many varieties this year: cinnamon, Genovese, purple, thai etc.)
Oregano
Parsley
Thyme
Rosemary
Chives
Shiso or Perilla futescens
Mint
Celery Leaves
Sage

References/Resources/Experiments:

http://www.hawaii.edu/gk-12/evo/hector/kanuikapono/7-11/SeedDormancy7-11.pdf

http://oardc.osu.edu/plantranslab/AdolescentSeeds/teachersguide.htm

http://gardening.about.com/od/totallytomatoes/ss/TomatoSeeds.htm#showall

http://www.ck12.org/book/CK-12-Life-Science-Concepts-For-Middle-School/r22/section/7.12/

http://www.smithsonianmag.com/travel/why-wild-tiny-pimp-tomato-so-important-180955911/?no-ist

http://www.splendidtable.org/story/how-nikolay-vavilov-the-seed-collector-who-tried-to-end-famine-died-of-starvation

http://www.seedsavers.org/Preservation/Genetic-Resources-Preservation/

https://www.regjeringen.no/en/topics/food-fisheries-and-agriculture/agriculture/svalbard-global-seed-vault/id462220/

Cool images and info about the Norwegian Svalgard Seed Bank!
https://www.regjeringen.no/en/topics/food-fisheries-and-agriculture/agriculture/svalbard-global-seed-vault/mer-om-det-fysiske-anlegget/id2365142/