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MAKING LIFE CYCLE CONNECTIONS...



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THAT CHANGE PERSPECTIVES!

Biomes... Ecosystems... Food Chains... For today's students connecting the processes that keep our world in balance enable them to realize just how connected each action taken on this earth is to almost every output in our lives. "Each week, we tailor-fit our lessons to a school's specific academic objective so their students understand how important classroom studies are to the real world around them," says Rob, Farm Educational Director. So when Mr. Rittel, teacher from Frederick Douglas Academy III in the Bronx, asked Farms For City Kids™ to bring this important classroom lesson to life with a hands-on learning experience, the 'Pasture to Cheese' lesson was developed as a food chain most relevant to their needs.

"The idea for this week's lesson was generated by our school's science teacher," says Mr. Rittel. "He has animals in the classroom but he wanted more focus on biomes, the web of life and the life processes that go along with that. Our students are city kids and sometimes I find their world is very small. They don't get a sense of how the world outside of their world works. Coming to the Farm allows them to make connections to so many things: How milk becomes cheese, how things just don't appear - that there is a whole process to it. And they experience a hands-on approach to those processes right to the end product. THEY 'LIVE' THE CYCLE."



LET'S GET STARTED

With the students settled in after their arrival, Rob sets out the 'Pasture to Cheese' lesson plan for the week. He mentions to the students that when he visited their school in the Bronx, he realized they were pretty much in the classroom all day - there weren't any open spaces where they could go outside to explore the ground. Rob lets them know that here on the Farm it will be the exact opposite, "All of you will spend this week in an outdoor classroom conducting experiments and exploring in the dirt a lot!"



The students will participate in 3 workshops for their **Pasture to Cheese** lesson: The first is the **Pasture Exploration** workshop where the students begin the cycle of identifying plants and bugs living in the soil to visually experience the diversity of each that make up the environment in which

the cows eat. And they will see the cows graze on those plants, then inventory their plants and dig in to investigate the soil those plants grow in.

The second workshop, **Grass to Milk**, illustrates how the process of what the cows eat directly affects milk production. The students will learn that certain plants contribute to flavorful milk production while other plants can impart an unpleasant flavor. It is for this reason that dairy farmers know to rid their grazing pastures of certain plants. Importantly, in this workshop the students learn the connectedness between rich soil and how it contributes to healthy plants and flavorful milk. And, the students will observe the actual milking process.



The third workshop, **Cheese Making and Tasting**, completes the cycle when the students learn how cheese is made from our milk. By tasting the end product they will focus on different taste buds

to describe familiar flavors like bitter and salty. Taking their taste buds to the next level, they will discover flavors like fruity, musky and earthy in the cheese. This method inspires them to mentally link their workshop experiences... from the field, to the soil, to the hay, to the milk, to the cheese. For the students it will become an "a-ha" moment - allowing them to identify with their learning and to see how that learning reaches far beyond their school classroom. The results become the **Lessons for a Lifetime**® Farms For City Kids strives to instill.



THE IMPORTANCE OF SOIL & THE LIFE WITHIN IT

The food chain starts at the soil level and the lesson begins with Rob quoting facts from *Dirt*¹, a comprehensive book on soil. As a result, the students come to understand the importance of the soil, the bugs and the worms in this biome.

- Not all dirt looks alike, but all of it is important to our world.
- Dirt, called soil by scientists, is one of the most important things on Earth, equal to air and water.
- Most soil starts as rock that wears down to small pieces called sediment. Sediment contains minerals. There are four sizes of sediment: (from large to small) gravel, sand, silt, clay. Size affects water absorption and how plant roots grow.
- Soil contains the minerals and organic matter plants and animals need to grow. A small parcel of soil can be home to several thousand living things like insects and microbes.
- Earthworms swallow and digest large amounts of sediment. In a year one earthworm can digest several tons of soil.
- Microbes, through digestion, provide nutrients to plants which supply food and oxygen for all of us.

We all drink the milk, from the cow, who ate the plant, which grew in the soil.

And Rob connects this all back to The Web of Life in our world:

- Cows produce manure which is put into the soil of the fields
- Bugs live in the soil and digest it
- The nutrient rich soil feeds the plants
- Cows eat the plants and digest them to produce:
 - Milk, as food to sustain the population
 - Manure, which returns to the soil

¹Steve "The Dirtmeister" Tomecek. *Dirt*. Washington, DC: National Geographic Society, 2002.

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PASTURE EXPLORATION

With a solid soil background in place, it's time for our students to head out to the pastures and hay fields where the Farm Educators will guide their discoveries.

Farm Educator Molly begins her lesson with a focus on the important role insects and bugs play in making nutrient rich soil for plants to grow healthy and strong. "We are going to take the top level off of this section of field to see what bugs may be under it. The bugs provide nutrients to the grass. So group... dig in with your hands and let's see what you find!"



The students pull out a long-legged bug and discuss how many legs it has. They count six legs which, they all agree, make it an insect. It also lacked wings so it could not fly. One student digs out the partial remains of a second bug. Molly explains it may have been bisected by her shovel and what the students are actually seeing is the bug's intestines which was releasing digested soil. A terrific discussion between Molly and the students follows their discovery:

"Since we all agree this bug probably won't live much longer, we'll just put it back into the soil," says Molly. "When it is put back, what will happen to it?"

The kids answer as a group, "It decomposes and turns into fertilizer. It becomes a part of the soil... the top layer that has all the nutrients to feed the plants."

Molly asks, "How does that soil feel to the touch?"

Student Jeremiah says, "Soft, very soft. The worms must have been busy!"

Molly asks, "Why do you say that?"

Jeremiah says, "Because they eat the soil and poop it out, and the soil gets soft."



"The science word for this type of insect manure is called castings," says Molly, "and it makes the soil really rich."

Finding another bug Molly asks, "What do we call insects that eat twigs and other organic matter in the soil?"



Student Jeffrey says, "Decomposers. They digest the matter and it turns into fertilizer."

"And look at this bunch of worms," says Molly. "Can you tell me what you know about this worm?"

Jeffrey says, "They have no vertebrae - no backbone like other animals and humans. But they do have lots of hearts."

And student Caleb looks thoughtful and asks, "If you cut off part of this worm, will it grow again?"

"If you cut it so all of the hearts are on one side, it will close up but not regenerate. If you cut it and all the hearts are not on one side of the cut... then it won't live. It will decompose and become soil. There are different breeds of worms, just like there are different breeds of animals. Depending on the breed there can be 5 or more hearts," says Molly.

"This is really changing my thinking," says student Edryan. "On Sunday I thought, 'Ok, the cycle of life, yeah I get it.' But now this has made me realize all the good things, and bad things, that happen when one of our animals dies. Let's say when an insect dies, then the species can go extinct. And then, in time, that can eventually affect us as it will affect our food chain first."

"I agree," says student Rachel. "When I got here, I didn't like bugs. I still don't, but now I see how important they are to us. And, even though we may not like them, I now see how we really do depend on them."

"This is exactly what we wanted our students to experience," says school teacher Ms. Hinkley. "It is so important that our students are able to experience this lesson hands-on. We have textbooks and videos in school for illustration, but here they are living it themselves. It's easy to hear and talk about life cycles and biomes, but when you can actually experience it, the learning is reinforced. Our students learn better in this real life environment because you can see them asking questions that are much deeper than what we hear at school. We hear our students talking to each other... making hypotheses about things. As a teacher, it is rewarding to see them have this level of passion about learning."

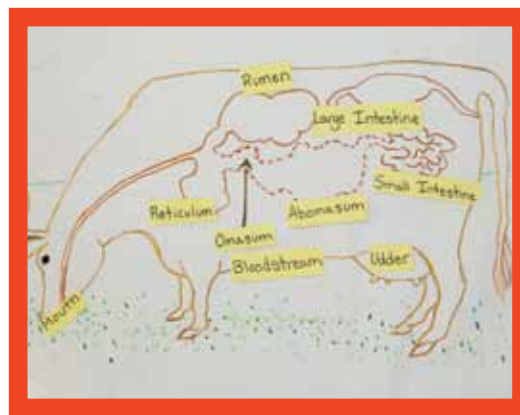


The students now take a sample section from the field. Back at the dorm they will closely examine their samples to gain a deeper understanding of its components... **and the cycle comes to life!**

GRASS TO MILK

Today the students saw where food comes from, but this workshop will demonstrate not **where** food comes from, but **HOW** it comes.

Molly displays a diagram of the cow's digestive tract. "Cows have a few stomachs, plus a small intestine and large intestine. The cow's entire left side is taken up by their largest stomach, the rumen, which is where the food goes after chewing.



"The reticulum, connected to the rumen, makes the food small enough to enter the omasum, another stomach. If the food is not made small enough, the cows regurgitate it - this is called their cud. The cow chews the cud again to make it small enough to move on.

"The food then passes into the abomasum where final nutrients are absorbed before passing into the small and large intestines as the waste we call manure.

"But all nutrients do not pass as manure - some go into the process of making milk. It's just like us - you have heard the saying, 'you are what you eat'. It's the same for the cow. If the cows eat onions, the taste transfers to their milk. If they eat sweet grass and plants, that flavor will transfer. In our pastures we grow good grass, alfalfa and clover. When that kind of food is eaten and absorbed, we are producing the right flavor of milk to make the type of cheese we want. Those are the flavors that get absorbed into the cow's bloodstream, which helps produce milk in the udder."



All our milk goes into making our cheese. Some farms have all their milk go to milk for drinking. Some farms produce a mixture of drinking milk and cheese. Others use their milk to produce yogurt, cottage cheese, sour cream and butter.

Rob says to the group, "When we were out in the field I heard George say that we were actually growing milk. What did you think about that?"

Says student Nana, "Well, the hay feeds the factory inside the cow. It changes into milk! But exactly how does the field affect the flavor of the milk?"

"Well," says Rob, "as Molly mentioned, if the cows eat onions, their milk will taste like onions. Then that flavor would pass on to the cheese. Plants common in the pastures, like dandelion, can be eaten by cows and we can eat them too. Clover is tender and sweet. Dandelions are bitter. Grass has a fresh taste to it. So the variety of the plants the cows are eating affect the actual flavor of the milk and then the cheese."

"So," Nana asks, "since the cows eat grass and hay, how come the cheese doesn't taste like grass and hay?"

"You will get the answer to that question in our next workshop when you taste different samples of cheese," says Rob. "You will have a 'tasting wheel' that lists all the different flavors cheese can actually taste like. Today you noticed the soil smelled fresh. You will see that some of the flavors for cheese are called earthy, fresh, nutty or buttery. So when you smell the soil and all of the plants in the field and then you taste the cheese, you will be able to link the smell to your taste buds. We will see if you make that connection."

CHEESE MAKING & TASTING

Now the students visit our cheese house to watch as raw milk is turned into cheese. "Our milk is heated to the ideal temperature," says Rob, "but not pasteurized which would kill off all bacteria. Some bacteria is good and we want to keep that for flavor. This good bacteria comes from the good food our cows eat. The cheese makers will add an enzyme called rennet to the milk.

Enzymes, which we also have in our bodies, make things happen - they change things. When added to milk, the milk changes from liquid to partly solid as rennet makes the protein particles come together to form little solid bits called curd. The curd will eventually become our cheese. Sometimes cultures, good living bacteria, are added to enhance flavor. Also, the amount of time a cheese ages affects its taste. Plus, the longer it ages, the harder it becomes."

Now the students are ready to taste three cheese samples:

- Cheese made from our milk with added Tarentaise cultures
- Cheese made from our milk without added cultures
- Cheese made from other milk with added Tarentaise cultures.

All the students voted and agree... the taste winner is Spring Brook Farm Tarentaise Cheese with added cultures!

Mr. Rittel says, "Class, you have experienced the life cycle of Pasture to Cheese. What has impacted you most?"

Isabel says, "Learning how the cows eat grass to form manure. Then that manure turns into fertilizer for the soil that grows the grass again. It's incredible how all of these things are connected."

Says Teresa, "I realize now we have to take care of everything in our environment. Each one thing affects the other. We are not the most important thing in the food chain. We depend on all the other animals."

"And, since we are at the top of the food chain, we have to protect all these things. When I get home, I want to talk about these things," says Jahshedah.

"And we got to be hands-on," Nana says, "to be able to do the stuff we basically don't have time to do at school. We don't have anything at school that represents nature like this."

"What is fantastic," says Mr. Rittel, "is our students have involved themselves in every aspect of this learning experience. They have been processing lots of information and are enthusiastic about learning. Their horizons have been broadened. In education, at its highest form, there is an idea called 'transfer', where a concept is learned and then brought back to another situation. Say, if our student grocery shops with their parent and looks at a package of meat, the student will think about the grass that was actually eaten to get to that end product. That is what becoming a lifelong learner is, and that is why being at Farms For City Kids is an integral component of our students' educational journey!"

