

The Mysterious Drop in the Drainpipe

Lesson Summary:

In this lesson, students will develop a better understanding of how drinking water gets into our homes, and where it goes once it leaves our homes. They will also learn how this process fits into the water cycle. In addition, students will learn how living conditions have changed over time with the advancement of technology and innovation.

References:

Lesson adapted with permission from:

1. Kentucky Environmental Education Council's *Wonderful Commonwealth of Water*, "The Mysterious Drop in the Drainpipe"

Teacher Resources:

Classroom Activities

- "Excuse Me, Is This the Way to the Drainpipe?" – page 102
 - Time: Approximately 1 hour
 - Materials:
 - ✓ Handout: "Excuse Me, Is This the Way to the Drainpipe?" (included)
- *Interviewing the Past* – page 108

Handouts

- "Excuse Me, Is This the Way to the Drainpipe?" – pages 103 – 107

Supplemental Lesson Resources:

Power Point Presentation

- "The Mysterious Drop in the Drainpipe" – available at:
www.mccrearywater.com/funzone/powerpoint9


Video


- "The Mysterious Drop in the Drainpipe" – available at: www.mccrearywater.com/funzone
(approximately 4 minutes)


The Mysterious Drop in the Drainpipe

Objectives:


Reading:


-  **RD-05-1.0.6**
Students will formulate questions to guide reading.

-  **RD-04-3.0.3**
Students will identify an author's purpose in a passage.
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-  **RD-04-4.0.1**
Students will connect information from a passage to students' lives (text-to-self), real world issues (text-to-world) or other texts (text-to-text - e.g., novel, short story, song, film, website, etc.).

Social Studies:

-  **SS-05-4.3.1**
Students will explain patterns of human settlement in the early development of the United States and explain how these patterns were influenced by physical characteristics (e.g., climate, landforms, bodies of water).

-  **SS-05-4.3.2**
Students will describe how advances in technology (e.g., dams, reservoirs, roads, irrigation) allow people to settle in places previously inaccessible in the United States.

The Mysterious Drop in the Drainpipe

Lesson Plan:

In the last lesson, we learned how water is treated to make it safe for drinking. But have you ever asked yourself how that water gets from the river to your faucet? Have you ever wondered where the water goes when you pour it into the drain? Do you think everybody's water comes from the same place? Do you think that all the water leaving everyone's houses ends up in the same place? Today we're going to answer those questions and figure out exactly where our water comes from and where it goes when it leaves our home.

Most of us seldom think about where the water we use in our homes or businesses comes from or where it goes once it disappears down the drain. The water we use every day is very much a part of the earth's water cycle and is continually recycled. When we use water, we are essentially sending it on a detour from its natural cycle and then, in short order, returning it back to the environment. Water can dissolve, suspend, and transport many substances. Therefore, the quality of the water we drink has a lot to do with where it has been and what has been in contact with it. For this reason, our water supply sources are not always drinkable and may need treatment to remove natural or manmade contaminants. All drinking water must meet federal and state standards that were put in place to ensure that the water is safe to drink. Needless to say, protecting our water from harmful contaminants to begin with is important.

Our drinking water comes from either ground water (e.g., wells, springs) or surface water (e.g., rivers, lakes, manmade reservoirs). Ground water supplies are usually extracted by a pump, treated and disinfected when necessary, and delivered to homes and businesses through a network of pipes called a distribution system. Many people who live in rural areas have individual, on-site ground water wells with very simple piping systems; many other people who depend on ground water, but live in more populated areas, receive their water from large water supply wells with more complicated distribution systems.

Surface water supplies are withdrawn from rivers, lakes, and reservoirs through large intake structures (go to www.mccrearywater.com to see a picture of McCreary County Water District's Raw Water Intake structure). The water is disinfected and often treated at a water treatment facility to remove impurities before entering the distribution system. Surface water supplies often travel through many miles of underground pipes before reaching the faucets of people's homes and businesses. Clean drinking water comes into our homes through one set of pipes and leaves our homes as wastewater through another set of pipes. The dirty wastewater that is flushed down the drain from our homes and businesses must be treated so that it can be safely and effectively recycled back to nature.

In rural areas, wastewater pipes are hooked up to small on-site sewage treatment and disposal systems, or septic systems, that are buried in the ground. In these systems, wastewater generally flows by gravity through a pipeline that runs from the home to a septic tank, where wastewater is partially treated before it flows onward to a leaching system. As wastewater passes through the leaching system (a buried network of pipes with holes through which the water passes) it is further filtered and treated by the soil and the microorganisms in the soil. Eventually, the treated water seeps into the ground water. In more populated areas, wastewater is conveyed from the home into a network of sewer lines which lead to a wastewater treatment plant. Here, wastewater is cleaned by mechanical, biological, and chemical processes before it is discharged into ground water or surface water. Water that is discharged from wastewater treatment facilities must meet stringent federal and state standards.

Both septic systems and large wastewater treatment systems rely on small, microscopic organisms (e.g., bacteria) to help clean up water. These organisms, nature's own built-in water purifiers, devour and digest organic waste material in the wastewater. The more efficiently the organic solids are digested, the cleaner the water. This is a big reason why it is important not to flush harmful substances, such as household hazardous wastes, paints, paint

The Mysterious Drop in the Drainpipe

thinners, and toxic cleaners, down the drain. These substances can kill naturally-occurring bacteria, especially in septic systems, and cause the systems to function poorly.

(At this time, give each student a copy of the Handout: “Excuse Me, Is This the Way to the Drainpipe?”)



The Mysterious Drop in the Drainpipe

Classroom Activity: “Excuse Me, Is This the Way to the Drainpipe?”

In this activity, students will learn where their drinking water comes from and where their waste water goes. This activity will also help to transition to the next unit which will deal with the science of water. Students will be introduced to the water cycle and the states of matter. This can be done as a class discussion or individually in about one (1) hour. If you choose to have students develop their own books (step 5), then you will need additional time. You’ll need copies of the *Handout: “Excuse Me, Is This the Way to the Drainpipe?”*

Here’s what to do...

1. Distribute copies of the story, “Excuse Me, Is this the Way to the Drainpipe?” Have students read the story on their own, or in small groups.
2. Discuss the story. Ask students if the water that is piped into their homes comes from a well by their home (like the little girl in the story). If students do not have a well at their home, ask if they know where the water comes from that is piped into their homes. If students are unsure about the source of their drinking water, ask them for suggestions on how they might find out more about the local water supply. (Recommend that students ask parents or contact the local water company for more information.)
3. Next, ask students where Martha Merriweather, the little girl in the story, lives — the city or the country. How do they know? Ask students if the waste water from their home goes to a septic tank in their yard, a wastewater treatment plant, or someplace else. Students may need to ask their families about this. (If you plan to have students graph this information, record the show of hands.) Ask students where the water is cleaned to make sure it is safe enough to drink before being piped into homes, schools and businesses. Ask students where the dirty water travels to when it exits homes in the city.
4. Call on several students to retell, in their own words, different parts of the route Willy Wetsworth traveled in the story.
5. As a culminating activity to Part 1, ask students to create a “Willy Wetsworth Travel Book” as they follow a drop of water through the hydrologic cycle, into their own home, and all the way down the drainpipe to wherever it goes to next. (Remind students to be specific as to the form the drop of water is traveling in at each stage of the trip — liquid, solid or gas.) Give students different options on how the book may be completed, including adding artwork or developing the book into a power-point presentation. Assign a deadline for completion, then give students time to quickly share their creations with other class members.

BONUS!

1. When discussing the story, collect information about the students source of water supplies at home, and whether students have a septic system, straight pipe, or send their waste water to a wastewater treatment plant. Graph the information using a computer and a graphing program. Display and discuss the graphs.

2. Invite someone who works for the local water or wastewater department to be a guest speaker and explain how water comes into and leaves homes, schools and businesses.

3. Investigate where the school gets its drinking water and where it goes when it leaves school.

The Mysterious Drop in the Drainpipe

Handout: “Excuse Me, Is This the Way to the Drainpipe?”

Martha Merriweather forgot to brush her teeth. She’d already said goodnight to her mom and dad, to Benji, her brother, and Lulu, her parakeet. She was all snug under her red polka dot blanket. In fact, she was pretty near asleep when she remembered about her teeth. It had been one of those days—one of those forgetting days. She forgot her lunch and had to borrow lunch money from Mrs. Johnson in the school office. She forgot her homework assignment and had to call her friend Terry to find out what it was. She’d even forgotten to feed Lulu until her mother reminded her. But Martha Merriweather did finally remember to brush her teeth. So she got out of bed, headed to the bathroom, turned on the light, picked up the toothbrush, picked up the toothpaste, put the toothpaste on the toothbrush. But, just as Martha was bringing the toothbrush with the toothpaste to her teeth, she noticed a drop of water that was just beginning to drip from the faucet—which isn’t so very unusual. But this drop didn’t drip and it didn’t drop; instead, it seemed to get bigger...and bigger. Furthermore, it seemed to be waving to her. Yes, it was waving to her. In fact, it seemed to be speaking to her. Yes...yes, it was speaking to her. In fact, it was asking her a question.

“Excuse me, is this the way to the drainpipe?” the drop was asking as it pointed to the drain in the sink.

“Yes it is,” answered Martha, her eyes wide open with amazement.

“But...but....you’re talking!”

“Yes,” said the drop, “I often talk when I have a question, and, if you recall, I did have a question! You see,” he said, “my travel book says that I should flow from the Merriweathers’ ground water well, continue on up through the Merriweathers’ water pipes, until I get to the Merriweathers’ bathroom faucet. At that point, my travel book says, I should dive downward to the Merriweathers’ drainpipe.”

“Merriweather?” cried Martha, “Merriweather? That’s my name—Martha Merriweather.”

“And my name is Willy Wetsworth, a traveler and adventurer,” said the drop. “Pleased to meet you.”

“A traveler and adventurer?” whispered Martha gleefully.

“Yep,” said Willy Wetsworth, “I spend my life traveling—in the clouds, in the sky, in the rivers, oceans, and streams, along the roadways, through the woodlands and grasslands, down in the soil, and between the rocks. Today, I’m traveling through water pipes—your water pipes. I was just pumped up into your house from the well in your backyard. It was a fun-foodling ride. Up, up, up, up, from the ground, then through this pipe and that pipe, until...well....here I am.”



“Wow!” said Martha, trying to imagine what it would be like to travel in water pipes. She thought it might be “fun-foodling” too, if she were wearing a snorkel and flippers. She thought it might be like zooming through a water slide at the amusement park.

“Do you mean to say,” she asked, “that any time people brush their teeth, or wash their hands, or take a shower, or wash the dishes, or do the laundry, or flush the toilet, or water the flowers...that all that water has just had an exciting ride through the pipes?”

“Yep,” replied Willy.



The Mysterious Drop in the Drainpipe

Handout: “Excuse Me, Is This the Way to the Drainpipe?” (Continued)

“Do you mean to say that all the water that people use comes right from a well in their own backyard?” asked Martha.

“Well...sometimes yes, and sometimes no,” replied Willy. “It says here in my travel book that some people, like the Merriweathers, live in the country where there are more trees than people, and where houses are spread apart.

So when people who live in the country need water, they can usually get it from the water deep in the ground in their own backyard. But it’s different in the city—the city’s where there are more people than trees, and buildings are closer together. City water is usually piped in from a big well, or a lake, or a stream, or a reservoir that might be right nearby or it might be many miles away. I have a friend who actually made the trip through city water pipes.”

“Really?” asked Martha

“Yes,” said Willy, “he started out at a big reservoir. From there he went through a big pipe to a water treatment plant.”

“A water treatment plant?” asked Martha. “What’s that?”

“According to my friend,” said Willy, “it’s a place where water is cleaned so it’s safe enough for people to drink.”

“You mean your friend isn’t safe to drink?” asked Martha.

“Well he probably is,” said the drop. “But, in our travels, we water drops never know what we’re gonna run into—or what’s going to run into us. Let’s face it, every living plant and animal on this earth needs us and uses us—people boil us, drink us, mix other stuff with us, and throw their scumdiddle glunk in us. There are so many ways we can get dirty. Most days, Mother Nature can clean us up without anybody’s help. But sometimes mother nature can use some help and a water treatment plant does just that—it’s kind of like Mother Nature’s little helper. My friend said it was really weird going through the treatment plant, but he felt good as new by the time he got out of there. But then...,” continued the drop.

“But then what?” asked Martha, who by now was trying to decide whether or not she would like it if she were a water drop.

“Then he took a wondrous, long, rip-snoodling ride through some great big pipes, and then some medium-sized pipes, and then some smallish pipes, right into an apartment house,” said Willy. “Other water drops went to other places like office buildings and stores and museums and libraries. And then...”

“And then what?” gasped Martha, thinking that, indeed, it might be fun to be a water drop.

“Then,” said Willy Wetsworth, “the people who live and work in those buildings turned on their faucets and used their water for something or other—like brushing their teeth.”

“Oh,” said Martha, looking at the toothbrush and toothpaste she was still holding. “I was just about to brush my teeth when I met you.”

“And I was just heading for the drain,” said Willy.

The Mysterious Drop in the Drainpipe

Handout: “Excuse Me, Is This the Way to the Drainpipe?” (Continued)

“But you mustn’t,” blurted Martha, who had already grown rather fond of the drop. “I mean...down the drain? What on earth will happen to you?”

“Well, it says right here in my travel book that I’ll wash down another set of pipes and end up in a septic tank that’s buried in the Merriweathers’ backyard.”

“A septic tank?” exclaimed Martha. “I’ve heard of that. A man came to clean our septic tank a little while ago, and when I asked my mother what a septic tank was she told me that it was a big box that holds our dirty water after it goes down the drain. She said it helps make the water clean again. The dirty water stays in the septic tank for a while and then goes into another pipe and then it goes into the ground.” Martha thought for a moment and then asked Willy, “Are you sure you really want to go down the drain to a septic tank? It sounds yucky!”

“It’s not so bad,” said Willy. “My travel book says the Merriweathers take good care of their septic system, so it does a good job of cleaning us up. My book also says the Merriweathers don’t throw all kinds of nasty scumdiddle glunk down the drain that might make my friends down in the septic tank sick.”

“You have friends in the septic tank?” asked Martha.

“Yep,” said Willy. “Heaps and gobs of eency, beency, plump, and jolly bacteria—Mother Nature’s little cleaner uppers. They live in the septic tank and love to eat the waste in your wastewater.”

“Ick,” thought Martha.

“They eat it and digest it and eat it and digest it,” said the drop, “and, like magic, they change it from harmful waste to harmless waste.”

“Wow!” exclaimed Martha.

“But like I said,” said the drop, “my bacteria buddies get sick when people throw nasty scumdiddle glunk down the drain.”

“What kind of scumdiddle glunk?” asked Martha.

“Oh, like paint thinner or plastics or oils or pesticides,” said the drop.

“Oh,” said Martha, who was beginning to think that being a water drop might not be as much fun as she thought. “I can’t say that I’ve ever thrown any glunk down my drain, and I know now—for certain—that I never will!”

“Hooray for you, Martha Merriweather!” shouted the drop. “As you know, I thrive on adventure, but I’ve heard there are some septic systems that even I wouldn’t want to visit. Some people just don’t take care of them and, after awhile, they clog up and bog down and then my bacteria friends are anything but jolly.

And then, of course...” said Willy, his smiling face giving way to a deep, dark frown.

“And then, of course what?” asked Martha, almost afraid to hear the answer.

“Then, of course, we water drops stay dirty, dirty, dirty,” he answered with a shudder, “too dirty for anyone to drink...too dirty for brushing anyone’s teeth.”

“Oh,” sighed Martha.

The Mysterious Drop in the Drainpipe

Handout: “Excuse Me, Is This the Way to the Drainpipe?” (Continued)

“But I’m going down that drain Martha Merriweather,” Willy laughed and pointed to the drain. His face was once again lit up like the Fourth of July. “And if I get a little dirty and smelly in the septic tank, so what? Everybody gets dirty and smelly sometime. Down there in the septic tank, I’ll hang out with my friends for a while and then, like you said, I’ll float out of the tank and into a pipe—a pipe with holes in it,” he said. “It says right here in my travel book,” Willy began reading from his book, “You will float out of one of the holes in the pipe and sink down into a big gravelly place. From there, just relax and enjoy your journey into the soil below. Here in the soil you will find yourself getting cleaner and cleaner and cleaner and cleaner. In time, you will find yourself back in the ground water, not far from where your little adventure began.” Willy smiled a big, wide smile and closed his book. Martha asked Willy if his friend in the city had gone into a septic tank when he went down the drain.

“Oh no,” replied Willy. “There’s no room for septic systems in cities. Your septic tank is only a short trip from your house, but in the city, all the dirty water that goes down the drains of all the apartment houses and businesses travels through oodles upon oodles of pipes—smaller-sized, then middle-sized, then bigger-sized pipes that are buried under the streets. All that dirty water ends up at a flumongous, magrungous wastewater treatment plant.”

“Another treatment plant?” asked Martha.

“Another treatment plant,” replied the drop, “but this one is called a wastewater treatment plant. A wastewater treatment plant is a place where dirty water that’s flushed down drains and toilets gets cleaned up so that it’s clean enough to go back into a nearby river, lake, stream, or ocean. Yep, my friend flowed into the wastewater treatment plant. He flowed from one big, flumongous tank to another getting cleaner and cleaner.”

“Were there heaps and gobs of eency, beency, plump, jolly bacteria to help him get clean?” asked Martha.

“As a matter of fact, there were, Martha Merriweather, jillions and scillions and gadrillions of them. They were eating and digesting and eating and digesting...they ate so much,” laughed Willy, “that after awhile they just sank to the bottom of the tank and took a nap.”

“Took a nap?” giggled Martha.

“Yep,” laughed the drop. “And, guess what they did next?”

“What? What?” cackled Martha. “What did they do next?”

“They woke up and started eating and digesting all over again,” roared the drop, swinging gleefully from the faucet. Martha was laughing gleefully too—she couldn’t help it—although she wasn’t sure which was funnier, the thought of jillions and scillions of plump and jolly bacteria having a giant feast or seeing a drop of water named Willy laughing himself silly.

“And what happened to your friend?” asked Martha, trying to calm her giggles down.

“Then,” said the drop, trying to calm his giggles down, “then he splashed out of the treatment plant and into the Witchywatchy River. That’s where I met him—in the Witchywatchy River. We spent one cold January as icicles on the bank of the Witchywatchy River.”

“Icicles?” shivered Martha. “Weren’t you cold?”

The Mysterious Drop in the Drainpipe

Handout: “Excuse Me, Is This the Way to the Drainpipe?” (Continued)

“Nah,” answered the drop. “We’re water. Sometimes we float and flow as a liquid, sometimes we freeze into ice, and sometimes the heat makes us evaporate into the air as a vapor. Its fun-foodling Martha Merriweather...fun-foodling. But now,” checking his waterproof watch, “I really must be moving on down the drain, and I think you must be brushing your teeth.” He noticed a big, wet tear well up in Martha’s eye and slide slowly down her face.

“Hey, hey, Martha Merriweather, I see a friend of mine sliding down your face—Tina Teardrop’s her name. When I see Tina Teardrop I know somebody’s sad. Are you sad?”

Martha felt her cheek for Tina Teardrop, but Tina had already evaporated into the air. “Must you go?” she asked. “I could keep you with me in a special, special little jar...” But Martha knew that a jar would be a very bad place for a traveler and adventurer. “Will I ever see you again?” asked Martha.

“Of course you will,” smiled Willy. “Whenever you turn on your faucet, or catch a snowflake in your hand, or see the frost on your windowpane, or watch the mist rise from your spaghetti water, or swim in a swimming pool, or watch a flower grow—I’ll be there. I’m always here, Martha Merriweather. But if I were to become too dirty, even you wouldn’t want to have me around. So make sure you let your friends and family know that we water drops need to stay clean—for the sake of all the people and animals and flowers and trees in the whole wide world. So, S.Y.L., Martha Merriweather.”

“S.Y.L.?” puzzled Martha.

“See Ya Later,” laughed Willy. “See Ya Later, Martha Merriweather,” he waved and winked.

“S.Y.L., Willy Wetsworth,” whispered Martha.

And, before her very eyes—right before her eyes Willy got smaller and smaller until he was simply and purely a drop at the faucet. But, he’d left something behind. And what do you think it was? He left his travel book with all the pictures of pipes and wells and ground water and ponds and lakes and oceans and glaciers and raindrops and snowflakes and... Martha picked up the little book and opened it to the first page. And what do you think she saw? She saw a little message. It said, “To my friend Martha Merriweather. From your friend, Willy Wetsworth.” That’s what it said.

As Martha brushed her teeth, she watched the foamy water wash down the drain, knowing that Willy was on his way to another adventure. She turned the water off, put her toothbrush away, and returned to bed. She crawled under her polka dot blanket, and then she took the travel book and tucked it carefully under her pillow. It had been quite a night...a FUN-FOODLING NIGHT!







The Mysterious Drop in the Drainpipe

Classroom Activity: Interviewing the Past

Once the first activity in this lesson has been completed, students should have a better understanding of where their water comes from and where it goes to. In this activity, students will learn how those same questions would have been answered in years past. They'll also learn about the history of water in McCreary County and gain some insight from the previous generation. This activity can be done in one night but students may need a few days to find an interviewee. You might also want to consider a guest speaker who lived in the county before there was a water district and could share additional insight about McCreary County life from half a century ago.

Here's what to do...

- 1.) Ask students how they think people got their water and disposed of sewage before there were systems in place to do this task. List the different ideas they come up with.
- 2.) Explain to students that they will be interviewing someone in their family or community who is over 65 years old, or who has lived in a rural area without running water or sewers, to find out where they got their drinking water when they were younger, and how they disposed of the waste water from their home.
- 3.) Ask students to think of some questions they might ask during the interview to learn more about how water was used long ago. Make sure they include the following questions in the survey if they are not included in their own questions.

-  Where did you get the water used in your home? How did it get into your house?
-  Approximately how much water did you and your family use every day?
-  How did you dispose of the waste water created by you and your family?
-  What are some of the differences in how water was used when you were my age and how water is used now?

NOTE: Explain to students that if they do not have a family member who is over 65 years old to interview, then they need to ask their parents for help in finding someone in their neighborhood to interview in person or by phone or email. Also, advise students that they may wish to take an audio recording device or video camera along to use during the interview so that they record accurate answers. (If students choose to do this, remind them to ask the person they are interviewing for permission to record or video prior to beginning the interview.)

- 4.) As part of the assignment, ask students to write up a final report or power-point presentation comparing the use of water 50 – 60 years ago with how it is used now in their homes. Assign a deadline for completion of the project.

Review!

Ask students to reflect on the interview and the comparisons they made between water usage 50 to 60 years ago and today in their written report.

Then, ask students to write a short paragraph summarizing (in their opinion) the most significant difference in water usage, or the most surprising thing they learned by completing this activity.