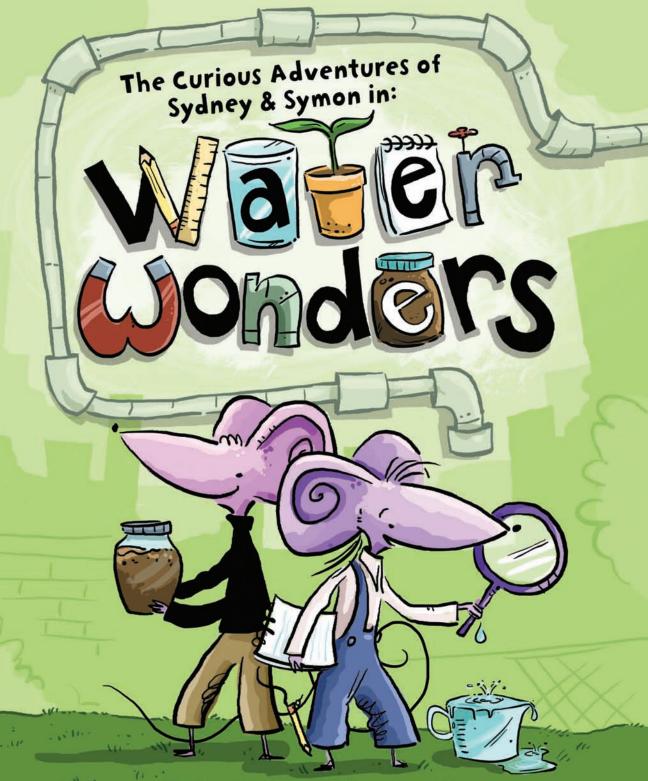
Peter H. Reynolds and Fable Vision present



Another Creative Collaboration with
The National Writing Project & Reading Is Fundamental

Water Wonders, young sibling scientists Sydney and Symon Starr "show what they know" as they explore science and engineering, expressing themselves through writing, art and song. Together, they bring to life the STEAM approach, which aims to introduce the arts to STEM education (Science, Technology, Engineering & Math) - adding the "A" (Arts) to STEM. STEAM is a way to invite more learners into subject areas that can often times seem intimidating and unapproachable. With its irresistible characters, story, and in-book extension activities, Water Wonders, not only delivers key K-4 National Science Standards, but it also models the "4 C's" in the 21st Century Readiness Framework: critical thinking, collaboration, communication, creativity. These are key to nurturing the next generation of innovators & inventors.

### Water Wonders is brought to you by:



### **National Writing Project**

The National Writing Project (NWP) is a network of educators working together to improve the teaching of writing in the nation's schools and other settings. NWP provides professional development to teachers in a variety of disciplines and at all levels, from early childhood through university. Founded in 1974, NWP is a network of more than 200 university-based sites located in all 50 states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands. NWP serves more than 130,000 participants each year.

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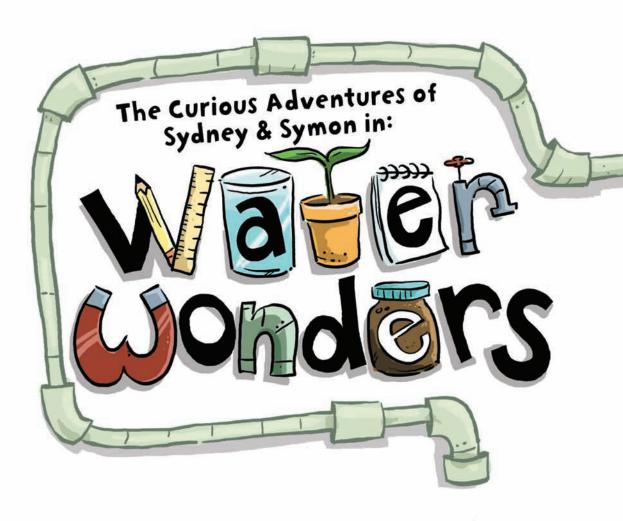
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FableVision is an educational media developer and publisher on a mission to bring the world to a better place through creating websites, digital games, animation, and books. Founded in 1996 by New York Times bestselling author and illustrator Peter H. Reynolds (The Dot, Ish, Judy Moody, The North Star) and his twin brother, Paul A. Reynolds, FableVision is dedicated to helping all learners reach their full potential, and to telling "stories that matter, stories that move."



Illustrated by Peter H. Reynolds and Renée Kurilla

Written by Peter H. Reynolds and Paul A. Reynolds

Science Advisor: Melissa Stewart



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# CHAPTER 1

# Stuck With a Problem in Wonder Falls

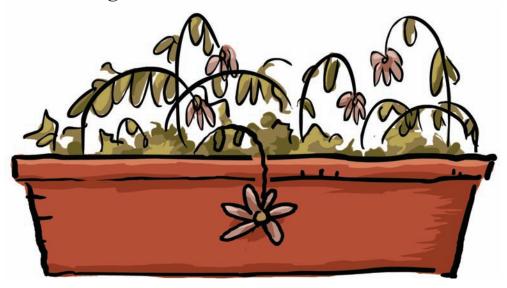
HOT! HOT! It was another steamy, hot, summer morning in Wonder Falls. Sydney and Symon Starr sat in the kitchen, writing and drawing under the ceiling fan, trying to stay cool.

Dad was struggling to open the kitchen window. He managed to lift the window just a few inches, but it was stuck and wouldn't



open up any further. "It gets so hot up here on the third floor, and these old wooden windows always get stuck on humid days!"

He stopped and gave a big sigh as he pointed at the window box outside. "If this window won't open, then we've got a problem. We need to give our flowers a drink. Look at them; they're all wilting!"

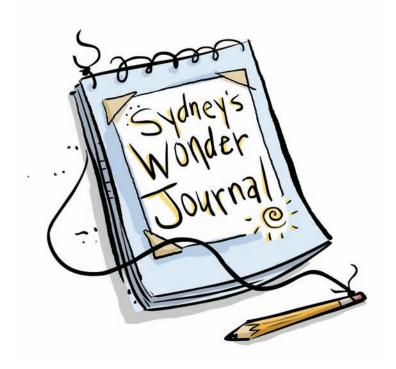


Sydney looked out the window. "Oh, no! Our flowers are frying in the heat!" The Starr family had planted the flower seeds a few weeks ago. The spring rains helped the flowers grow quickly. But now, during this first summer heat wave, the soil had dried up and the flowers needed water—fast.

Symon shouted, "We need a rescue plan!"

Sydney and Symon glanced at each other with determined looks and said, "Looks like we have another problem to wonder about — and solve!"

Sydney ran over to her Wonder Journal, a blank book that had a pencil attached to it with a piece of rainbow-colored yarn. This was a very special place where she put all her wonderings, questions, predictions, plans, and observations. Symon dashed to the computer where he and Sydney kept electronic versions of their Wonder Journals. They both got busy recording all the details of their great flower rescue adventure. Sydney and Symon were ready to tackle another big problem.



# **CHAPTER 2**

# A Jarring Conclusion



The tea kettle on the stove was whistling wildly. Dad was making his world-famous iced tea for Mom, who was hard at work writing a new science storybook.

As Dad turned the stove off, Sydney looked up from her Wonder Journal. "Why do you use hot water to make iced tea, Dad?"

Dad smiled. "I see why that seems funny, but I heat the water to help get the flavor out of the tea leaves. Then I let it cool and then I add ice cubes."

"I wonder if we could make ice cubes made of tea?"

"Good wondering!"

"Dad, another thing I'm wondering about is where does that window glue come from?"

"Window glue?" Dad asked.

"Yes. The stuff that's making the window stick," Sydney said.

"Ah, right. That's not glue. It's called 'humidity," Dad explained.

"Where does humidity come from?" Sydney asked, as she wrote the question down in her

Wonder Journal.

"Humidity is water in the air," Dad explained.

"I don't see any water in the air." Symon wrinkled his nose as he wondered.

"Well, water vapor is in the air...but the drops of water are so tiny that you can't see them," Dad insisted. "I just heated up the water in the tea kettle, and it got so hot that some of the water evaporated. It turned to steam, and that vapor is escaping into the air."

Symon snapped his finger. "Hey Dad, don't some ships use heated water to make steam that pushes their paddles around and around?"



"That's right, Symon. When you hear the steam boat's captain say, *Full steam ahead!*, you know that steam power is going to make the ship move on the water as fast as it can."

Sydney pondered. "Water...heat...steam..."
Suddenly she had that "Aha! I've got it!"
look. "Full steam ahead!" she squealed as she quickly drew a picture and explained as she sketched. "I think the sun heats up the water in the ground, lakes, oceans...and it evaporates into the air...and that's what makes the air humid."

"That's some good water wondering, Syd," Dad smiled. Dad sometimes shortened her name from Sydney to Syd – S-Y-D – which she loved.

Dad pointed to the stuck window. "You see, the wood is absorbing the water vapor in the air like a sponge – the more water the wood soaks up, the bigger the wood gets – until it's too big to slide up the window frame."

Symon jumped up from the table. "I'm sure you're right about that 'water-floating-in-theair' idea, but let's try an experiment to see if you're right. I predict that we'll actually be able to see how the sun evaporates water from the soil with my amazing 'Dirt-in-the-Jar Water Wonder Experiment."

And so they grabbed a glass jar and a big spoon and went into the yard.

Sydney and Symon dug a deep hole, scooped up some cool, moist dirt, and filled the jar half way up. Back inside, Sydney added a spoonful of water to the jar. Then they put the lid on the jar and left it on the windowsill in the hot, hot sun. Later that day, the sides of the jar had steamed up; big drops of water were rolling down the inside of the jar.



They had predicted that the water in the ground would go into the air when it was heated, and they were right. Sydney and Symon could see the water droplets on the glass.

They shared the results of their Dirt-in-the-Jar experiment with their Dad. Dad was very impressed. "You're right, kids. The water evaporated into the air inside the jar, then condensed on the glass into droplets of water."

Sydney ran to write this all down on the computer.

Dad continued, "The water rolling down the side of the glass is like rain – or precipitation – and it accumulates back in the soil, and starts the circle all over again. That's what we call the water cycle."

"What if we just covered our wilting window box plants with upside-down glass jars?" Sydney wondered.

"Would the water we catch by evaporation give the plants a drink?" Symon added. "Or would it get too hot for the plant inside the glass jar?" Sydney asked. "More wondering, more questions, that's great," Dad said, as Sydney and Symon recorded the Dirt-in-a-Jar results and new questions in their Wonder Journals. Symon observed, "Isn't it cool how questions lead to more questions? And they go on and on and on."

Dad smiled, "Ah! You're thinking like a scientist now; scientists are curious people who never stop asking questions. They want to figure things out, and that helps solve all sorts of problems."

Sydney added with a big smile, "We're going solve our flower problem, just wait and see."



# **CHAPTER 3**

# The Leaky Problem

Later on that morning, Sydney sipped on a cool glass of lemonade, noticing the droplets of water condensing on the glass. "So, we know more about humidity. But how do we help our flowers? They're in tough shape."

Symon replied, "Well, we know there's water out there in all sorts of places. The question is: how do we get it to our flowers when we can only open the window a little bit?"

"Hmmm," Sydney wondered. It got really quiet for a while. Then all of a sudden, she jumped up and shouted, "Eureka! I bet Ms. Fractalini could help us. She's one of the most creative science thinkers we know." Ms. Fractalini was their Science and Art teacher at Wonder Falls Elementary School. She always would say, "Science is an art. Creativity solves problems!"

"Right, Ms. Fractalini could help for sure!" exclaimed Symon. "As she says, 'Let's turn science *thinking* into science *tinkering*!' Maybe we can visit her tomorrow and get her help."

Then Sydney's eyes got very wide all of a sudden. "And what about Uncle Rusty? He could help us, too." Uncle Rusty worked for the city in the Public Water Department. They made sure water got from the water reservoir twenty miles away to every faucet in Wonder Falls. "He loves engineering solutions to problems."

Symon and Sydney began their own "thinking and tinkering" talk, imagining all sorts of wonderful inventions that would save the flowers. But before long, Sydney became very distracted. There was a sound that kept interrupting her concentration.

### DRIP!

"What is that sound?" Sydney asked.

DRIP!

And then, DRIP!

And then, DRIP!



It had a nice beat. DRIP. DRIP. DRIP. Symon loved music and this sounded great to him. But Sydney turned and saw the dripping kitchen faucet. "Whoa! Not good," Sydney announced.



"Syd, they're just little drips," Symon observed. But Sydney insisted, "Little drips will add up: one drip, two drips, three drips. By the end of the day, it will be a whole lot of drips and that's water that could save our flowers!"

Sydney knew she couldn't just say the drips would add up to a lot of water; she had to *show it*. It was time to gather evidence that these little drips would quickly add up.

So Sydney grabbed a measuring cup, and put it in the sink under the faucet. Symon ran to his journal and started writing about the experiment. Symon glanced at the clock, and wrote: "Put cup under faucet at 10 o'clock in the morning."

Sydney then drew a little picture of the faucet in her journal. "We'll keep checking all day long. I think by dinner time, the cup will be full," Sydney pondered out loud.

And then Symon cheered, "Full steam ahead, Sydney – let's get moving fast. Those flowers are depending on us!"



# CHAPTER 4 Questions Are Delicious

It was nearly lunchtime and the Starr family was gathered around the sink. "Wow! The cup is overflowing, just

from those little drips." Sydney exclaimed. "It's twelve o'clock now, so that's more than one cup of water collected in two hours!"



"If we're wasting a cup of water every

two hours, that's a whole lot every day," Mom observed. Symon was already busy writing in his Wonder Journal, calculating how much water was lost in a whole day.

Sydney poured the cup of water into a pot, to save it for the wilting plants. Mom promised she would continue to collect the dripping water that day.

Dad patted Sydney on the shoulder. "You two are always noticing things, collecting information, making predictions and



connections, and solving problems. You are our very own Wonder Squad!"

Mom nodded. "I bet with that information you've collected, you could figure out how much water our faucet would drip in a year."

Symon grinned, "I wonder if I never took a bath, how much water would we save in a year!" They all laughed.

Over lunch, they talked about the leaky faucet and had lots of water questions that kept flowing like water from a waterfall.

"Where does the water in the faucet come from?" asked Symon.

"How much water is there on Earth?" asked Mom.

"How do farmers get water to their fields when it doesn't rain enough?" asked Dad.

"How do we fix the leaky faucet?" asked Sydney.

Sydney's family LOVED questions. They wrote them all down and put them in the tin can labeled: "Questions Are Delicious!"

At every meal they talked, shared, and wondered together. Today, the Starr family had a lot questions about water, and Sydney and Symon were ready to get some more answers that would help save their flowers!



# CHAPTER 5

### The Art of Science: Show What You Know



Sydney and Symon set out to be Wonder Falls' experts on water. Sydney and Symon enjoyed finding people who might have the answers — and going to places like libraries and museums where they could discover all sorts of new things to help them be creative problem solvers.

First they stopped by Wonder Falls Elementary School to see Ms. Fractalini. "Ms. Fractalini – we've got a problem!" Sydney and Symon cried in unison.

"Oh, GREAT! I absolutely LOVE problems!"

Ms. Fractalini nearly sang as she clapped her hands with joy. That always made Sydney and Symon laugh.

Sydney grabbed her Wonder Journal and began reading all the



notes about their flower rescue adventure, including how she and Symon had measured the water drips leaking from the faucet in the kitchen. Symon also read some of the calculations they had made, predicting how much water their faucet would drip in a day, and a year.

Ms. Fractalini was impressed. "Sydney and Symon, I love your Wonder Journals. Journals are a great way to record as you go and show what you know.

Sydney and Symon both smiled. "I especially like those pictures you drew, Sydney." Ms. Fractalini added, "Lots of scientists draw their ideas."

Sydney nodded as she pointed to a poster on the wall. "Leonardo DaVinci loved science, math, inventions, and drawing great pictures!"

Sydney, Symon, and Ms. Fractalini spent time together, taking all the calculations and information they had gathered, and creating colorful graphs on the computer to show and think about the data they collected. As Ms. Fractalini shared, "Graphs are a great way to turn numbers into pictures so things are easier to understand."

"They show what we know!" Symon added.

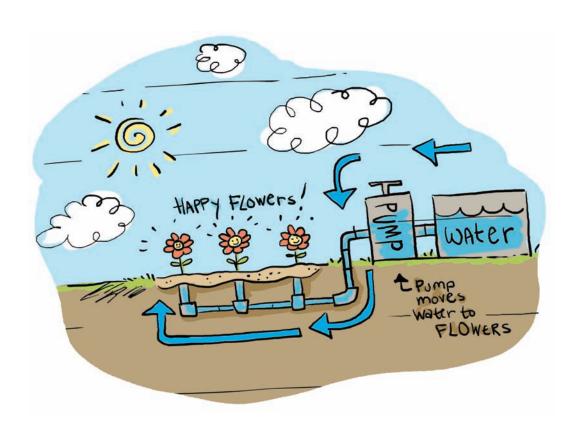
"Right, Symon. And graphs make it easier to make guesses about measurements we haven't even taken yet," she explained, as they created a computer graph to show how much water they would save if their leaky faucet was fixed. It turned out to be a LOT of water.

As they worked, they also talked about water: where it comes from, how water can turn into steam and ice, how water flows, and where it goes. And then they read books together about irrigation and water wheels, pumps and wells.

Ms. Fractalini drew pictures to explain everything. Sydney and Symon made notes and drawings in Sydney's journal about everything they learned – as well as lots of new ideas and new inventions from all their reading-writing-talking-listening.

"Well, we better get going if we're going to save the plants," Sydney eventually announced.

"Thanks, Ms. Fractalini," Symon chimed in. As they walked out the front door, Ms. Fractalini called after them, "Good luck, kids – *full steam ahead!*"



# CHAPTER 6

### Pump Power



Sydney and Symon then went to see Uncle Rusty at the Wonder Falls Water Department. The Water Department makes sure clean water goes to everyone's kitchens, bathrooms, and gardens. Uncle Rusty was excited to see them. "Syd and Sy! Want to help me fix something?" Uncle Rusty asked, as he opened his big tool kit.

"Sure!" Sydney said.

Symon joined in, "While we help you, we need to ask you some questions about water to help us save the flowers at our house. We've got water coming out of places we don't want —"

"- leaky faucets," Sydney interjected.

Symon continued, "And the water is not getting to the places where we do want it —"

"- our window box full of very sad flowers!" Sydney said as she showed a picture of the stuck window and window box.

"Oh, have I got some ideas for you! But first, this pump needs a valve loosened to make the water flow into this big pipe."



"We learned about pumps from Ms. Fractalini; now you can show us in person," Sydney said. She and Symon helped do some "thinking and tinkering" with Uncle Rusty until the water began flowing the right way in the big city water pipes.

Uncle Rusty then showed them all the improvements he had made at the Water Department. He explained how different kinds of pumps move water from one place to another. Sydney and Symon asked lots of questions and took notes as they went.

At the end of the tour, Uncle Rusty stopped and said, "Now, about those poor little flowers of yours. You might want to think about how you could pump your water from where you have it to where you need it."

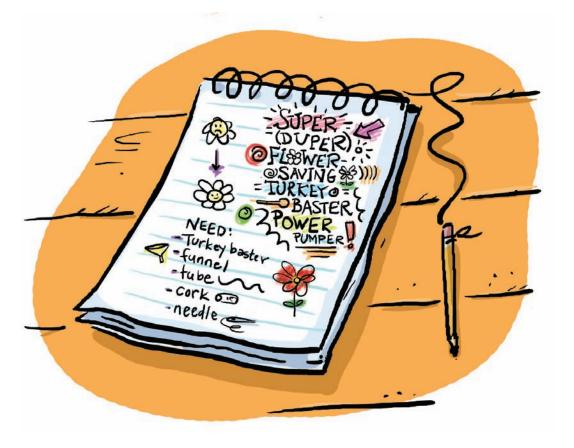
Sydney and Symon both turned and looked at each other with their "Eureka! Wow-Do-I-Have-A-Great-Solution" look on their faces. Sydney quickly made some notes and pictures in her Wonder Journal.

"I think we have some good ideas now for an invention to water our window box flowers," Symon announced.

"Yes," Sydney agreed, closing her journal and holding it tightly like a treasure.

"Now it's time to go home and put all our ideas together for a super creative problemsolving invention!"

Sydney and Symon waved to Uncle Rusty as they both ran out the door. He was smiling from ear to ear; he knew that Sydney and Symon were on another "full-steam-ahead" mission!



# CHAPTER 7

# From Wondering to Wonderful!

Sydney and Symon went home and quickly set to work on an invention to water the flowers in the window box.

They used a turkey baster, a funnel, a long plastic tube, a small cork, and a tool to make holes in the tube. This is what it looked like:



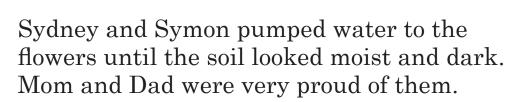
When they finished building their invention, they set out to test it. First, with Dad's help, they were able to open the stuck window just a few inches and push the tube through.

Then Mom brought over the pot of water they had collected from the leaky faucet. Using a

measuring cup, Sydney measured a half-cup of water. Then Sydney sucked up water from the measuring cup with a turkey baster, and began to use her invention: the *Super-Duper-Flower-Saving-Turkey-Baster-Power-Pumper*. She carefully squeezed the water into the funnel. The water flowed down the attached tube and slowly leaked from the tube's holes to water the flowers.

Sydney squeezed more and more water into the funnel. Dad snapped a few pictures with his camera, which Sydney and Symon would later put in the computer Wonder Journal.

"Yay! It's working!" Sydney squealed. "Our invention is giving the flowers a drink."



Mom said, "I'm sure the flowers will recover very quickly now – standing straight and colorful again."

Dad added, "Look over at the sink, Wonder Squad; that's not the only problem we solved today."

Sydney grinned. "You fixed the leaky faucet!"

"We worked together," said Mom, "just like the two of you."



Sydney and Symon sat together and added all of this new information to their Wonder Journals, including how to get even more water through the *Super-Duper-Flower-Saving-Turkey-Baster-Power-Pumper* to the flowers.

Sydney was SO happy. She went to her bedroom and wrote a song to share what she learned. She played it on her box-o-cord — an instrument she invented that made all sorts of wonderful sounds. Symon joined in on his drums. They even shared their song on the family's web channel, Starr Radio, where the motto was "Wonder With Us!"

Several days later, the Starr family was having a big party in their back yard. Everyone was there: Mom, Dad, Sydney, Symon, Ms.

Fractalini, Uncle Rusty, school friends, and lots and lots of neighbors. Sydney and Symon played and sang their song, "The Water Cycle Goes Round and Round." Everyone sang along.

As the party was finishing, all of a sudden, they heard a big BOOM! It was the sound of thunder.



They all ran inside into the kitchen. Through the window, they saw drops of water fall. Drip, drip, drip. The rain poured from the sky. The plants in the flowerbox looked very, very happy!



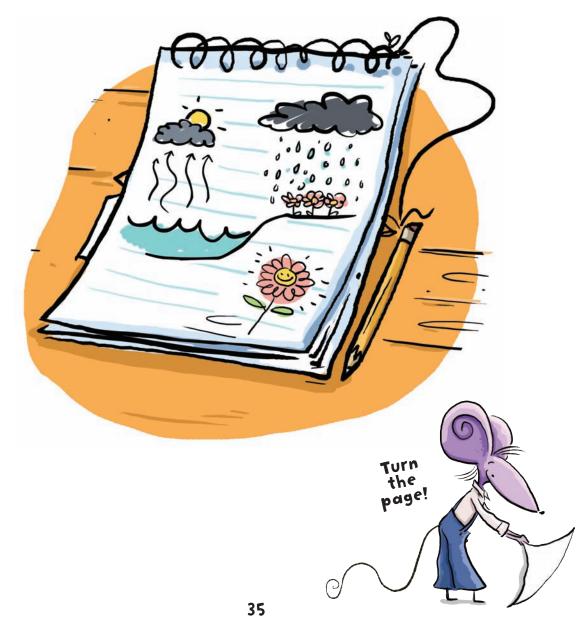
Ms. Fractalini exclaimed, "Looks like the rain clouds liked your song, Sydney and Symon." Everyone laughed and cheered.

Sydney and Symon were very happy and very proud. It all started with paying attention and wondering about the world. And then with lots of talking, listening, reading, writing, and drawing, they were able to do some very creative problem solving.

Sydney and Symon knew that they could make "wonder-ing" into "wonder-ful" — and they were both ready to do it again and again to solve any other problems they might discover.

Because wondering is . . .

The Beginning.



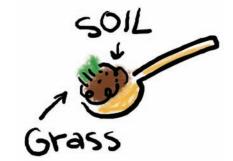
# - SCIENCE ACTIVITIES -

# Water Cycle Wonders

Science Concepts: States of Matter, Evaporation, Condensation, Precipitation, Water Cycle

Symon's Dirt-in-the-Jar Water Wonder Experiment won't work in some places, but here's a similar experiment that will give Wonder-ful results no matter where you live.

- **1.** Go outside and scoop up three spoonfuls of soil and a little bit of grass.
- **2.** Place the soil and grass in the bottom of a small, re-sealable plastic bag.



- **3.** When you come back indoors, add a spoonful of water to the soil. Be careful not to drip water on the inside of the plastic bag.
- **4.** Seal the bag and tape it to a sunny window. Then fill out the table on page 37.
- **5.** Check on the bag after 5, 10, and 15 minutes. Draw and write about what you see in your Wonder Journal.
- **6.** After 15 minutes, tap the sides of the bag. Can you explain what you see? Turn to page 42 to read more.



Time	I Noticed That
5 minutes	
10 minutes	
15 minutes	

# Make Your Own Cloud

Science Concepts: States of Matter, Evaporation, Condensation, Water Cycle





While Sydney and Symon were visiting Ms. Fractalini, she told them how they could make a cloud right in their own kitchen. They could hardly believe it! "How cool would that be?" said Symon. Sydney and Symon wrote Ms. Fractalini's instructions in their Wonder Journals and tried the experiment the morning of the party. You can try it too.

- **1.** Ask an adult to help you boil some water in a tea kettle.
- STOP OF THE PROPERTY OF THE PR
- **2.** After the water has cooled just a bit, ask the adult to pour the water to the ½ cup mark on a measuring cup.
- **3.** Carefully add the water to a large, glass jar.



**4.** Place a metal pie pan on top of the jar and add 10 to 12 ice cubes to the pan.



- **5.** Wait 2 minutes and then shine a flashlight through the jar.
- **6.** Draw and write about what you see in your Wonder Journal. Can you explain what happened? Turn to page 42 to find out.

# Notes

# Making Water Disappear

### Science Concepts: States of Matter, Evaporation, Water Cycle

After Sydney and Symon saved their flowers, they kept on wondering about water. They had so many questions. They thought of all kinds of water activities, including some tricks. "Betcha I can make water disappear," announced Symon. "No way," said Sydney. "That's impossible." "Oh yeah?" replied Symon. "I'll prove it! But it will take a few days."

Here's how you can do the same trick as Symon.

- 1. Fill two identical drinking glasses with room temperature water.

  Mark the water level with a piece of masking tape.
- 2. Place one glass in a warm, sunny window or under a lamp that is turned on. Put the other glass in the refrigerator. Do you think that water in one of the glasses will really disappear? If so, write down your prediction in your Wonder Journal.
- **3.** Now fill out the table on page 41.



**4.** For the next week, compare the water levels in the two glasses every day. Draw and write about everything you notice in your Wonder Journal. Was your prediction right? Can you explain why?

Day	Refrigerator: I Noticed That	Sunny window: I Noticed That
1		
2		
3		
4		
5		
6		
7		

### - ANSWERS AND EXPLANATIONS -

### **Water Cycle Wonders**

Heat from the sun will warm the soil and air in the bag and cause the water to evaporate. When water vapor comes into contact with the plastic bag, it will condense and turn back into liquid water. Tapping the bag will make the water droplets roll down the sides of the bag and go back into the soil, like precipitation.

### Make Your Own Cloud

A cloud forms in the sky when warm, humid air comes into contact with cool air, and that's exactly what happens in this experiment. The hot water at the bottom of the jar heats the air above it. Some of the hot water evaporates into the air. The air at the top of the jar is cooled by the ice. When the warm air and cool air meet, water vapor condenses into tiny water droplets and forms a cloud—right there in the jar.

### Making Water Disappear

Over time, some of the water in the glass placed in the sunny window or under the lamp should seem to disappear. Heat causes the water to evaporate into the air. Because water vapor is an invisible gas, the water will seem to disappear.

### Find Out More

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