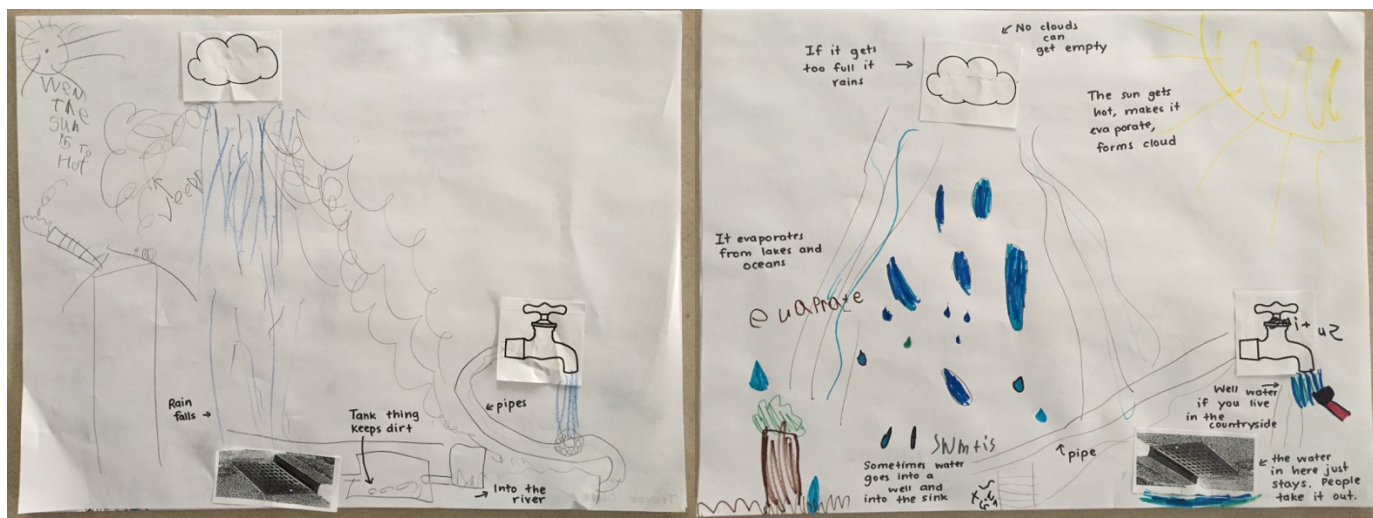


# Water Inquiry in Room 102

## Opening questions

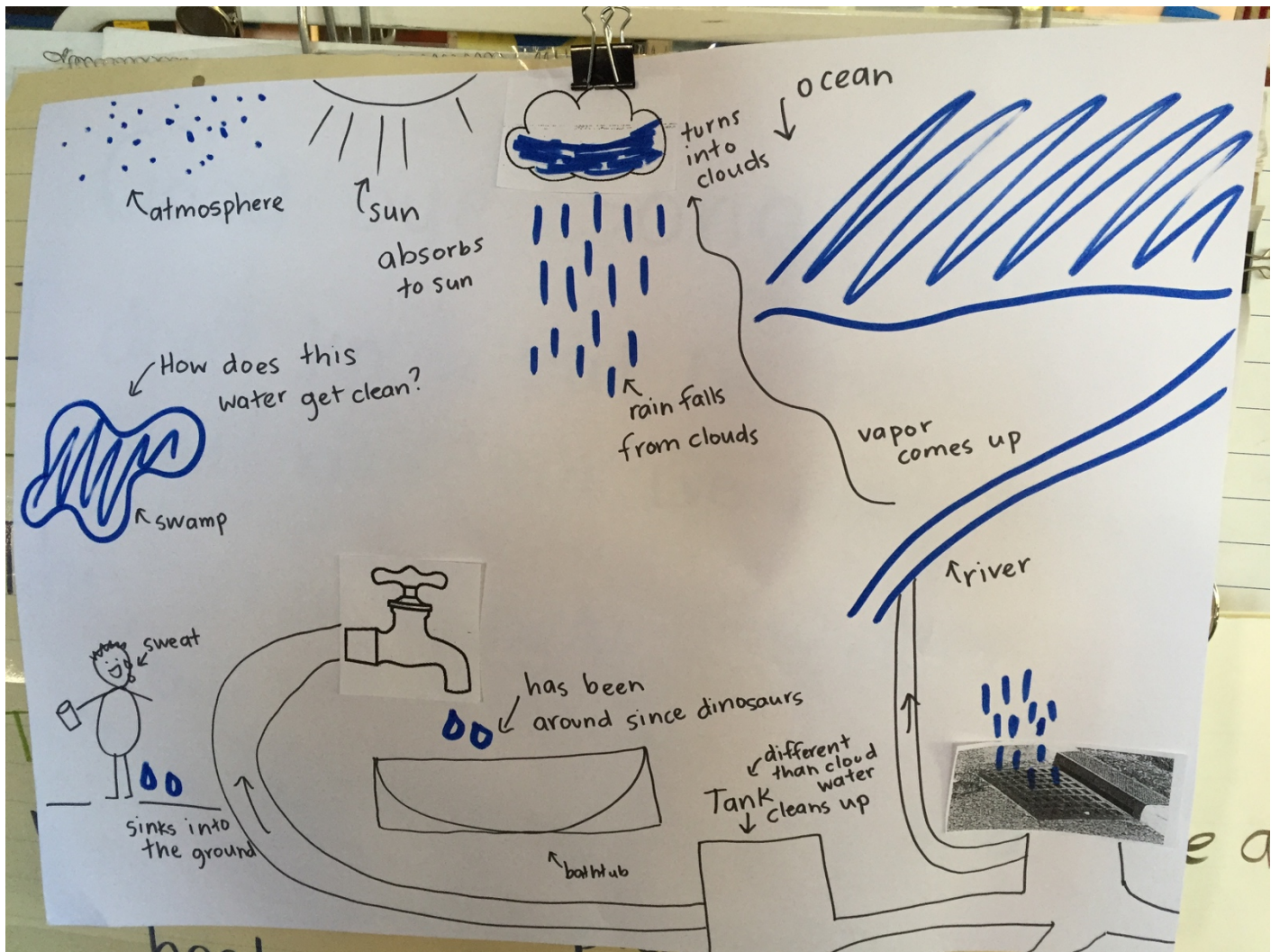
The Water Inquiry project in Room 102 began with a large sheet of white paper and three small images. As students sat in pairs at their tables, I handed out the supplies. “Where does water come from?” I asked them, “and where does water go? Use these pictures to help you tell the story of water.”

Students quickly set to work. Most began by glueing the picture of the cloud somewhere near the top of the page and the storm drain near the bottom. Where to put the faucet was less clear to the students: “Why don’t we wait until we draw the house” I heard one child say.



I walked around chatting with students about what they had drawn. I asked probing questions such as “Can you tell me what this is?” or “What happens after this part?”. In many groups I wrote the words they told me as they pointed to the different parts of their maps. Most posters showed water falling from the clouds, a pipe connected to the faucet and some way to catch the water (swamps, oceans, catch basins).

Once students had a chance to represent their ideas on posters, we came together as a class to make a shared map. I began by asking them where to place the three images. Next, I took suggestions on how to represent the water in between.



Two interesting conversations emerged from our representation:

**Can water run out?**

“No, if clouds are empty rain fills them up again.”

“No, our water has been around since the dinosaurs.”

“It just keeps going around and around.”

**Is all water the same?**

“Sweat is not the kind of water that goes into the clouds.”

“Tank and pipe water is different than cloud water.”

“We can only drink the cleaned up kind.”

# Inquiry Inc. and The Missing Ducklings

We kept our shared poster in the meeting area for several days, adding to it as necessary. It was now time for us to launch our investigations about water by piloting the interactive story: Inquiry Inc. and The Missing Ducklings. On a bright November morning, we read the first part of the story, where we meet Anna and the cast of Inquiry Inc. Immediately, the students were drawn in to the story thanks to the colorful illustrations and engaging dialogue. After identifying Anna's problem (There are five ducklings stuck in a storm drain!), students were excited to explore the storm drains on the school grounds. In small groups led by an adult holding a map and flashlights, students wandered around the school observing grates and the contents of storm drains.

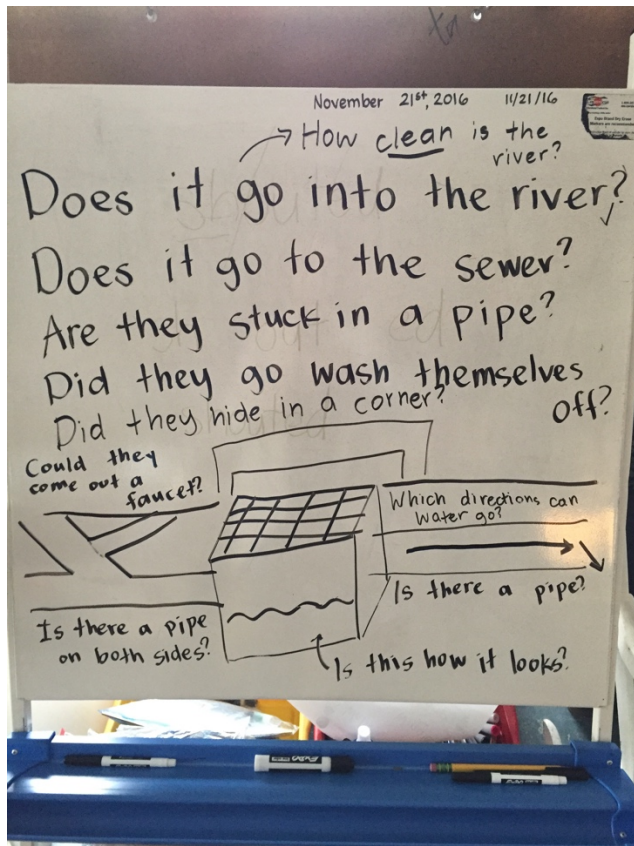


Students crowd around the “disgusting drain”, named for the strong odor of decomposing leaves found at the bottom. This is the only storm drain with a metal grate on top and an opening in the back. Students guess that the duckling must have fallen through this kind of drain. While observing closely, one student drops her pencil down into the drain. This later becomes an important twist in the Inquiry Inc. story!

Students record their words and drawings on clipboards with a simple prompt: I notice. Many students noticed the different kinds of grates covering the storm drains. Several tried to fit their hands or feet through the holes, attempting to reenact how the ducklings could have fallen through.



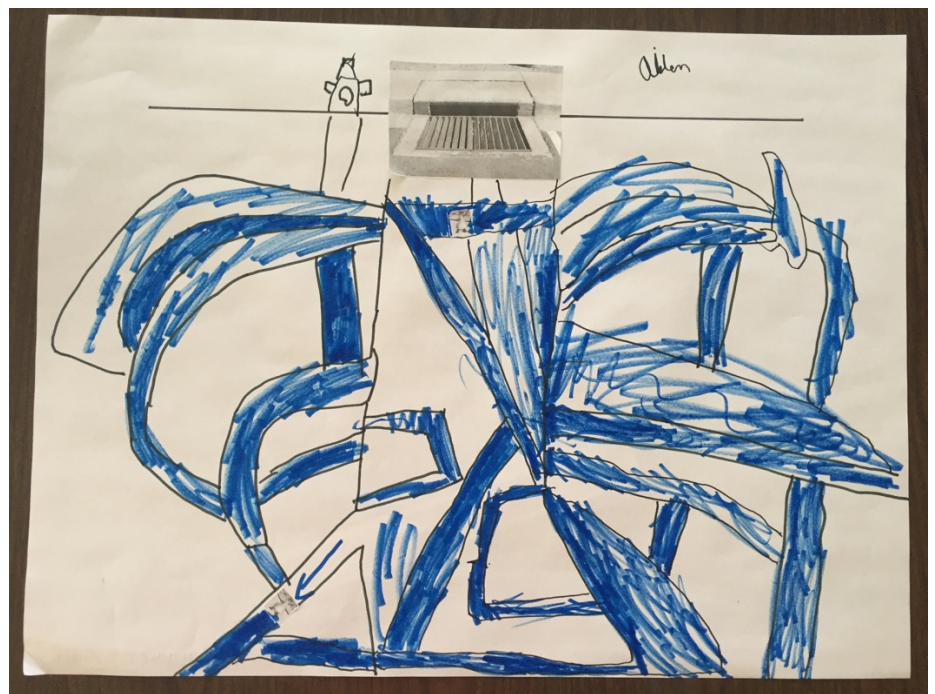
# Could they come out of a faucet?



As we followed the steps for inquiry as outlined in the book, we needed to stop and ask ourselves some questions.

Students became fascinated with the idea of where the ducklings could end up. They wondered what it looked like underground, how the pipes were connected, and where they all ended up.

Students were given another large white sheet of paper, this time with a picture of a drain and of two ducklings. This is an example of their interpretation of how the drain systems work underground. The ducklings are caught in the maze of pipes.



# How do drains really work?



Students were curious about the logistics of the drains. Unable to see cross-sections underground and armed only with their representations on paper, they set out to build models of storm drains.

Their discoveries included:

- Water flows downhill
- Things in the drain can transfer from one cup to the other if they are small enough to fit through the pipe
- You can siphon water by pushing the pipe (straw) down and then letting it come back up again
- The water won't go through the pipe until it is high enough to reach it
- When there is a lot of water or you pour it quickly, it rushes to the next drain

**Students watch the water rushing through the pipe from one drain to the other.**

**“It’s raining in the story!” someone announces.**

**“The drains will get full!” someone else exclaims.**

**“Then what will happen to the ducklings?”**

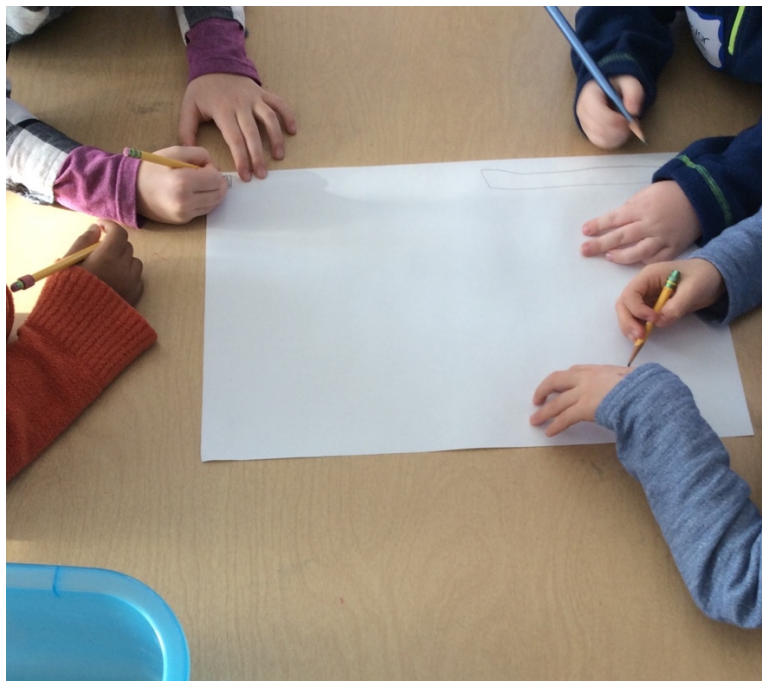
## Safe and Sound – Now What?

The students were relieved to read that Inquiry Inc. “listened to their ideas” about storm drains connecting and water running downhill. They were excited that all five ducklings have been rescued by the end of the story. As we read about Inquiry Inc. walking away, we sang their cheer one more time...

***Got a problem that won't go away? Inquiry Inc. will save the day!***

The final handoff in the first Inquiry Inc. story was to engineer a drain that allows good things to fall through and keeps out items like ducklings. We brainstormed a list of things that should and shouldn't go through a drain. Water was a unanimous decision, but it got trickier when it came to rocks, sand and leaves. Should they be able to fall through the drain? Students disagreed and decided to write that it is acceptable for a little bit of those items to fall through. We decided that in general, trash, large leaves, sticks and branches should not fall through a drain.

Students then broke into groups of four. Led by an adult, they began designing their drains on paper.



Many designs featured a system for allowing water in (small holes, slits in between sticks), a stable upper layer (flat sticks, two layers of aluminum foil, tightly stretched saran wrap).

The first grade NGSS standards call for students to make a plan before they begin an engineering project. Here students had the opportunity to collaborate and incorporate many ideas into one design.



Once they completed their plans, I checked all of their designs.

“What if the openings between the paint stirrers are too wide and rocks can fall through?” I asked this group.

They decided the paint stirrers needed to be touching.

“What if leaves collect on top of your drain and the water can’t fall through the slits anymore?” I pushed.

They agreed to leave one end “open” for more water and larger objects to fall through without getting trapped.

Once the whole group had agreed on their design, I sent them over to grab materials. They was a wide selection, but this group already had a clear idea of what they were looking for!

The materials included:

- Saran wrap
- Aluminum foil
- Paint stirrers
- Book spines
- Fly swatters
- Mesh backpacks
- Sponges
- Filters
- Scouring brushes
- Duct tape
- Coffee filters
- Plastic straws
- Recycled materials
- Rope and twine
- Popsicle sticks



Once a group finished building their first prototype, we tested their drain. First, it had to hold a rubber duck for one minute without the duck falling through. Next, I poured dirt, sand and rocks on top to see what would fall through. Finally, I dumped water to see what would happen.



This group was not pleased with their initial results. The small slits in between the paint stirrers did cause debris to build up, making it hard for the water to flow through. The mesh helped hold the leaves, but there was nothing to move the leaves away once they had gathered. The large opening for water did work – but it worked too well! Large amounts of debris had fallen into the drain, filling it with unwanted objects.

It was back to the drawing board. This group used long dowel rods to envision a leaf removal device. They added duck tape to their wide opening and punctured it with holes to allow only water to flow through. They installed a “pusher” to compact the leaves as they built up.

Satisfied with their improvements, we did a second test. They cheered as they heard the water flow to the bottom of the drain. They demonstrated how their mechanical arm pushed away the leaves and crunched them into pieces.



# Water, and our inquiry, are both a cycle

As our pilot of Inquiry Inc. and the Case of the Missing Duckling drew to a close, students had a chance to reflect on their learning. Returning back to our original water poster we had made as a class, some students still wondered if all water was the same. Enthralled by the maps of pipe systems underground, many students wanted to explore where the ducklings might have ended up if they had just kept going from drain to drain.

Armed with this question, water group writers went back to the drawing board. Using a single moment – when one of my student’s pencil fell into the “disgusting drain” – they added in a subtle detail to the story. Right as the characters are about to rescue the final ducklings, Silvia, too, drops her pencil in the drain. Carlos makes a joke that the ducklings will now have something to write with, and the story moves on. Not every group that reads this story will pick up on this small detail, but my class did. “That’s just like what happened to us!” they exclaimed. “Where will it end up?” I asked. Students’ hands shot up as they were brimming with theories. The story may be over, but our inquiry has just begun!

## P.S. Where did the water go!?!?

The other morning I noticed that all of the water had disappeared from our storm drain models that have been sitting on the heater in front of the window.

“Where did the water go?” I wondered out loud.

“Oh, we were talking about it,” one student replied, “and we think maybe it sunk in.”

“Actually I think it evaporated.” Another student chimed in.

“Where does the water go when it evaporates?” I asked.

Several students who had gathered around were quiet.

“Could the water that was in these cups end up in a storm drain?” I wondered aloud.

“No!” one student laughed, “it’s not the same kind of water. It’s different, like sweat water.”

And there we were, back at the very beginning. We’ll see where these new questions take us!

