Inquiry Inc. in Group S
Teaching Inquiry Inc. and the Case of the Missing Ducklings in a 3rd Grade Classroom
By Ruth Neils

This curriculum was originally designed for lower elementary, though the ideas, questions, and content that it explores are as engaging and important for 3rd graders as it has been for lower grades. As I taught these lessons in a 3rd grade classroom there were just a few slight adjustments I made to the content to account for the knowledge of students in the classroom, their familiarity with the lesson content, and their age. Most of these modifications involved allotting more time for whole-group discussion (because students had so many ideas and questions to share), providing extended opportunities for students to express their theories and way of thinking on paper through drawings and writing. I considered adding a written component to these series of lessons, like an ‘Inquiry’ journal where students could record their thoughts and questions as we read through the story (also integrating more ELA to the lessons) but I did not have the time, though this is something I would like to try with future groups of 3rd graders. This investigation into questions of water and inquiry strategies fostered a number of engaging, detailed, and dynamic discussions about water and the world around us that 3rd graders in Group S enthusiastically grabbed on to and delightedly pondered.

Getting to Know Inquiry Inc.

It was a dry October day when the 3rd grade students in Group S were introduced to Inquiry Inc. and the Case of the Missing Ducklings. Though there was no rain in sight, students gathered together at the classroom rug to continue talking about water and the question, “Where does the water go?”

I began reading the first few pages of the story to the class, stopping at the story’s first handoff. “What would you do if you were Anna?” I asked. The students turned to their neighbors at the rug and shared their ideas about Anna’s predicament and their initial solutions to rescue the five trapped ducklings!

“I would pull the top of the drain off and scoop them up!”
“I might call someone to help me.”
“Maybe, I could reach my hand down and grab the ducks.”

Investigating Water At Our School

After sharing some engaging ideas with the whole class, we continued reading to the second handoff, prompting the group to go outside and investigate the storm drains on the school grounds. Students grabbed their jackets, along with clipboards, pencils, and blank note sheets to document their ideas, questions, and observations and we headed outside to explore.

Students wandered around the school playground, first identifying all of the storm drains, and then venturing to each drain to experience each one close up. Students used flashlights to peer into the deep drains, noting the difference between the contents of each drain (some with quickly flowing water, others with stagnant smelly leaves) along with the various shapes of the drain grates and the color of any of the pipes visible inside.
At the end of this exploration, students reconvened to share some of their observations with their classmates. During the discussion, the guiding question from their river study was quickly brought up in the context of the drains:

“Where does the water in the drains go?”

This framing question served as a critical consideration in the explorations that followed.

**Planning Note**

Students recorded their noticing’s using papers divided with blank space for drawings and a lined section for any written ideas. Some students also chose to use the back of their note sheets to draw detailed maps of the playground with the drain locations throughout.

**Water All Around Us**

Students came back to the rug on the second day of Inquiry Inc. eager to share all of the features of drains they had noticed on their way home the day before and in their neighborhoods, comparing these drains to the ones they explored on the playground the day prior.

Once students were posed with the handoff questions, “Where does the water go? Where could the ducks be? Do you have any other ideas about how drains work?” they were each given a sheet of paper with a picture of a drain at the top. The students were given the task of expressing their ideas to the handoff questions. As the students got to work I asked, “What is underground? What does a storm drain look like underground? Where does the water go? Where might the ducklings be?”

**Individual v. Group Work**

I had students work on these drawing individually, as a method to gauge each individual student’s ideas and thinking about these ideas. This activity could also function as partner or small group work, depending on the group of students in the classroom and the goals you have for this activity.
Some students hunkered down and began to sketch out incredibly detailed and complex drawings of underground drainage systems and the path the ducklings may have traveled. Other students drew a quick sketch of the drain and the space directly below it and then finished. I encouraged students to add detail to their work, so that their ideas of where the water goes once it goes down the drain express their thinking. By the end of the lesson, a number of students were interested in continuing to work on their drawings.

Student drain drawings

Planning Note
In order to accommodate students’ continued interest in thinking about the handoff questions, I had students use their original drain drawings as ‘first drafts’ of their initial ideas and thinking. The group came together to share their initial drawings and ideas and then, we spent another day in class creating a final draft, where students integrated all of these ideas into their work.

What do we know about water?

After spending time finishing up final drafts of their drain drawings, students excitedly gathered at the rug with their work. Arranging each student’s work in a circle around the rug, students did a gallery walk to examine their classmate’s ideas, considering questions such as:

- “What do you notice about each drawing?”
- “What question do you have for the artist?”

Gathering back together, students shared one similarity and one difference to their own drawings that they noticed in their classmates’ work. “They all showed evidence that drains flow into bigger bodies of water,” one student shared. Following a lively debate about how water might travel underground (some student ideas included hypotheses about

Key Point of Engagement
Placing the images of ducklings onto the drain drawings was a big hit throughout the class. These images served as really effective tactile tools to consider where and how the ducklings may have traveled once they fell into the drain. Some students chose to draw the ducklings into their work themselves instead of using the cutout images, while other students moved the cut-out ducklings through their drawings, considering the different directions they could have traveled. Attaching the duckling images to a popsicle stick or some sort of handle so students could more easily move the ducklings through their drawings may be one way to ground student thinking and allow students to explore the possible paths the ducklings may have traveled.
slanted pipes, underground currents, and giant fans with electricity to push the water). At the end of the discussion, I left the students with the question:

“How can we use these ideas about how water travels to think about where the ducklings might have gone?”

Students participating in a gallery walk in Group S

Problem Solving in Action

This day was a pretty quick exploration of handoff ideas for the 3rd graders in group S. The handoff asked students, “What tools does Inquiry Inc. have?” Earlier in the book, students in the class had already been keeping track of the tools the group had and generating their own possible solutions with these tools to rescue the ducklings.

Students shared solutions that could rescue the ducklings, using the tools that were available. As students explained their ideas, I used the tools to model the solutions students were explaining.

“Squish the net through the hole in the grate and scoop up the duckling.”
“What if it doesn’t reach?”
“Tape the end of the net to the handle of the hammer.”
“It’s really deep down that drain. That still might not reach, and you could accidentally drop that down the drain too.”

After a flurry of idea sharing, students were eager to hear Inquiry Inc.’s solution.

A note about materials

I brought in actual versions of each tool Inquiry Inc. had instead of using the provided printed images. I asked the group the handoff question and as students listed the tools, I pulled them out of a bag and placed them in the center of the rug for students to explore.
Some students expressed interest in drawing and writing about their ideas for how to rescue the ducklings, involving a number of complex, detailed solutions. This is one direction you could explore with older students.

**What should go in drains?**

The students were thrilled that Inquiry Inc. saved the ducklings using ideas that students had suggested based on students’ understanding of storm drains and water traveling underground.

At the end of the book, students engaged in a lively discussion about what we DO want to go down the drain and what drains should keep out. The class generally agreed that storm drains should keep out unwanted debris/animals and that drains should carry away runoff water, like the drains on the school playground do. There was a debate among the class about how much debris should be able to get through the drain. Many students explained that it was inevitable that some small debris (like sand, dirt, and very small leaves) would be okay to go through the drain, otherwise the top would clog.

In the end, students established that drains should keep out as much debris as possible, but students continued to think about methods to keep this debris from clogging the top of the drains, leading to a very detailed discussion about how all designs can be improved, even existing designs. With this very tall order as a guide, students broke off into small groups to brainstorm and design two possible plans for their drain design. Many designs incorporated a number of layers of materials to ‘filter’ the water that traveled through the drain and to keep out all of the unwanted materials.

![Image: Drain design drafts](image)

**Planning Note**

Each group was first just given a single piece of paper and a chance to explore the available materials before being given a pencil to record their ideas. Each group of students was given one pencil to encourage students to work with their group members to design a plan all members of the group were comfortable with. Students were encouraged to either choose one group member to record the group plans, or to take turns with their group members writing/drawing ideas for their plan.
Planning, Prototyping, and Producing: Engineering the ideal drain

On drain design day, students gathered together at the rug, buzzing in anticipation for their drain construction. I started the lesson introducing the idea of a ‘prototype’ as “Your best idea the first time you make it. A design that you can learn from.” “What if your plan doesn’t work? What if you need a new plan?” students asked. Third grade NGSS standards call for students to consider possible solutions to a problem based on available materials and resources while the success of a design solution is based on the desired design features, while various plans for a solution can be compared based on how well they meet the specific criteria for success. Here, students discussed the process of engineering and design, considering ideas of multiple iterations of a model and process of revision. Students reached the conclusion that all drains (and human-made structures) are created this way.

The classroom filled with excited chatter as students got to work constructing their drains. As I walked from group to group, I heard students testing out ideas, asking questions, and working with their group members to build their drain prototypes. “What if the duckling’s feet get stuck in this mesh?” one student asked another. “Hmm, what do you guys think if we added a coffee filter as another layer on top of this one? It could stop that from happening by covering the big holes!” another group-mate responded.

Once each group finished their drain we tested it with a number of objects. The first part of the test was that the drain needed to let water through, so we poured ‘rain’ water from a pitcher over each drain to see what would happen. Then, we scattered natural materials like pine needles, small sticks, dirt, and sand on top of the drain to see what would fall through. The final test was to place a rubber duck on the top of the drain to see if the drain could hold it. Each group huddled closely around their drain during this ‘testing’ considering the successes and the challenges of their prototype design when in action.

After the prototype testing was complete students gathered back at the rug to discuss their design process. Students shared one aspect of their drain design that worked and one thing that they would choose to do differently in a future design. Many groups shared similar ideas about what they might do differently next time, while others shared with pride the processes they used to get their drains to come together:

**Drain Construction Materials:**
- Popsicle Sticks
- Pipe Cleaners
- Aluminum Foil
- Cheese Cloth
- Mesh Cloth
- Plastic Chicken Wire
- Coffee Filters
- Rubber Bands
- Small metal buckets
- Colanders
- Parchment Paper

The role of drafting in design

The students discussed with their group members to decide on a plan to follow for their drain design. While most students choose one of their two designs, one group chose to take aspects of their two separate plans and combine them into their final drain design. I had pre-prepared baskets of supplies for each group to simplify the distribution of materials, so students were able to get to work on their drain prototype right away once they chose their ‘blueprint’ plan.
“First we tried to hold all of our popsicle sticks together with tape, but then we realized that tape wouldn’t work when it got all wet, and that’s what a drain’s all about, so we realized we could use rubber bands to hold them together and that worked great!”

Other students reflected on materials they would choose to remove from their drains in future designs because they got too soggy (the cheesecloth) or made the water flow too slowly (the coffee filters):

“I think they have a good reason for making drains out of metal” said a student, discussing the structural integrity of the materials used for the prototypes. “But, we are just trying out ideas now, once we got the right types of materials for our drains and if we were actually going to build one, we would use stuff like our ideas, but harder and stronger, like metal and thick plastic.”

A number of ideas for design revision included considering the speed that the water traveled through the drains, and many students commented on all the materials that got in the way. “There might be such a thing as too many materials in a design.” I proposed as students nodded in agreement, sharing how some of their prototypes had too many materials, and in a future design they would more carefully choose fewer, but more useful materials.

*Drain prototypes being tested with water, ducklings, and natural material*
Teaching Inquiry Inc. in 3rd Grade

The drain prototyping and design wrapped up the handoffs from the story of Inquiry Inc. and the Case of the Missing Ducklings, but the ideas and the questions that this story raised for the students in Group S flowed directly into the larger examination of water and rivers that the class is studying in the coming months. While students explored their ideas and answered many questions about water through this story, a number of pressing questions still remain open for inquiry and exploration “Where does the water go?” “Where does the water once it’s underground?” “How does water move?” While Inquiry Inc. closed the case of the missing duckling, the case of water inquiry is endless and so are the directions this exploration can take.

Throughout these lessons, there are three main big ideas with which students engage: water, inquiry, and collaborative work. After teaching this series of lessons in a 3rd grade classroom, here are some of my reflections about these big ideas and their impact on student learning.

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<th>Water</th>
<th>Inquiry</th>
<th>Collaborative Work</th>
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<td>These lessons brought up so many ideas about where water goes, how it flows, how it moves, and what makes it move. The lessons fit very well with the broader science topic in the 3rd-grade class where they are studying rivers along with NGSS Science Standards.</td>
<td>These lessons served as a great addition to the existing work the students have been doing engaging in inquiry and collaborative theory building. All of the discussion based handoffs were really useful sparking student ideas and led to meaningful discussions and theory-building exercises.</td>
<td>The structure and progression of these lessons provide so many varied opportunities for whole class discussion, group work, and class-wide investigation/problem-solving.</td>
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The drain drawings were a great jumping off point for discussion about what is underground, the ‘systems’ under the drains. In earlier discussions, many students were very certain about what they believed happened beneath the ground. Ex: “The water goes to the ocean” and “All of the drains are connected,” but after working on the drain drawings and looking at the similarities and differences between the drawings, students’ original certainties became disrupted. During one of the individual work times, a student in the class asked what ‘inquiry’ meant. This question led to a fruitful discussion between the student and her table partner about how people engage in inquiry and why it might be useful. If I had time, I would have liked to continue this discussion with the whole class, or at least pose the question to the class to think about. Having some sort of discussion about ‘inquiry’ itself may be a useful addition to the first. These lessons provide a lot of flexibility in regards to the amount of collaborative work that a teacher chooses to use. In many instances, I chose to make the lesson activities that were suggested as group work into individual work (ex: the drain exploration, the drain drawing activity). I made these changes because of the particular group of learners in the classroom. However, these individually completed activities were easily integrated back into whole class discussions. |
as they began to consider new ideas about water systems underground. | lesson and a concept to build from throughout the rest of the lessons. | preserving the collaborative nature of the Inquiry Inc. story overall.
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At the end of this series of lessons, a huge fascination about how water moves in pipes remained. Some student questions on this topic include: Can water just move through a flat, straight pipe? Are all pipes tilted slightly to flow into bodies of water? | Activities like the drain exploration, or even just the format of the handoff questions in the book were useful and engaging ways to promote students ‘curiosity and spark student interest in considering water and theory-building. | After teaching these Inquiry Inc. lessons, I am excited to use the collaborative work the class has done to generate new theories and problem solve about future questions and ideas in all subjects, using this work as a model. The structure and design of Inquiry Inc. lessons facilitate cooperative work, and the Inquiry Inc. characters model this type of thinking and problem-solving.
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At the conclusion of this series of lessons, most of the students still seemed to believe that all water in drains is ‘sewer water.’ Discussing the different types of water that travels through pipes could be an interesting direction to continue to explore. Guiding questions might include: “What does it mean for water to be ‘dirty’?” | Though the Inquiry Inc. lessons were originally designed for a 1st-grade audience, the lessons were still appropriate and engaging for 3rd graders. These lessons were especially effective because they related closely to other ideas and topics that this class has been considering and will continue to study throughout the year.