

Inquiry Inc. and the Case of the Missing Ducklings
Teacher Resource for Making Student Thinking Visible

By Ruth Neils

The primary goals of the *Inquiry Inc. and the Case of the Missing Ducklings* story and the companion lessons are to get students interacting with ideas about water, inquiry, and collaboration. Throughout the story, students will engage with all of these ‘big ideas’ frequently and in a variety of ways. In order to make student thinking visible and track the progression of student ideas about these three guiding topics throughout the lesson sequence, here are a few assessment ideas that can be used individually, or collaboratively. Accompanying these assessment ideas is a rubric for making thinking visible, divided into the categories of **ideas**, **connections**, and **extensions** (ICE) which can serve as a tool for evaluating student progress.¹ This resource document provides a ICE rubric assessment tool, aligned with relevant Next Generation Science Standards, along with examples of how to use the assessment tool to evaluate student work in the context of *Inquiry Inc. and the Case of the Missing Ducklings*.

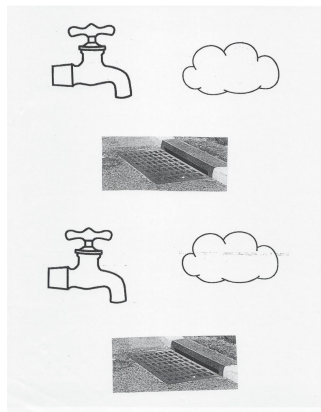
Water, Inquiry, and Collaboration Framing Questions

Where does water come from?	Where does water go?	What does water do underground?	How does water move?
What is inquiry?	What does good inquiry look like?	How can inquiry be used to investigate ideas?	What does good collaboration look like?

Pre-assessment Activity: Making Thinking Visible Diagram

Before introducing the book, *Inquiry Inc. and the Case of the Missing Ducklings*, start by engaging student thinking about water and the inquiry process.

Give students each a piece of paper and [three small images](#) (see below). Explain to students that the images can be attached anywhere on the page. Ask students to think about water, with the guiding questions, “Where does water come from and where does water go?”



Cloud, Faucet, and Drain image sheet

¹ Lorraine Chiarotto, *Natural Curiosity: A Resource for Teachers*, 1st ed., 2011.

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Example of a student cloud to drain to faucet diagram

What does inquiry mean?

The generation of these questions can lead to a whole class discussion about Inquiry. This discussion might start with the framing question: ***“What does inquiry mean?”***

Then, this initial discussion can serve as a frame for the introduction of the Inquiry Inc. story and the types of investigation and exploration with which students will be engaging.

What does collaboration mean?

One of the primary goals of this series of lessons is to model what good collaboration looks like and to provide students with opportunities to productively collaborate to identify problems and investigate possible solutions.

In the first few days of the lesson, either during the Cloud to Faucet to Drain activity or the introduction of the story, *Inquiry Inc. and the Case of the Missing Ducklings*, take time to have a conversation with students about collaboration. This conversation may follow a very similar structure to the group conversation about inquiry and it may build on existing classroom norms about working together with which students may already be familiar. You might choose to begin this discussion by identifying collaboration between the Inquiry Inc. characters. Read page 12 in *Inquiry Inc. and the Case of the Missing Ducklings* to students and discuss the ways that Inquiry Inc. story characters are collaborating and working together.

Continue this discussion with students using guiding questions like: “What does collaboration mean?” “How can you be a collaborator in the classroom?” “How can collaboration be helpful when you need to solve problems?” Reflect back on the process of collaboration throughout this series of lessons. Check in every few days with students about collaboration, asking how students in the class are collaborating with one another and when characters in the Inquiry Inc. story are collaborating as well.

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Post-Assessment: Making Thinking Visible Diagram (revisiting the same question)

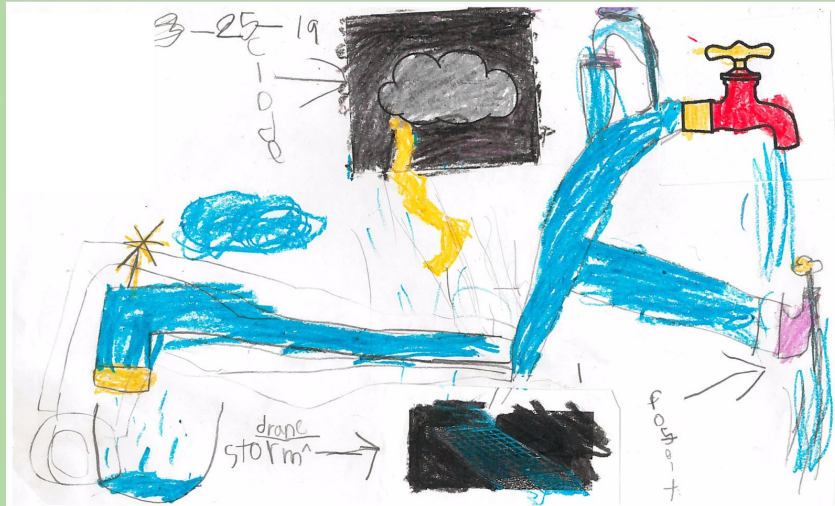
Following the completion of the Inquiry Inc. story, provide students with the same materials (a piece of paper and image of a drain, a cloud, and a faucet). Remind students that the images can be attached anywhere on the page. Provide students with the same prompt, “Where does water come from and where does water go?”

Give students time to complete their diagrams, then come together as a class to discuss how ideas about this question have evolved. This conversation is also an opportunity to consider questions that still remain and new questions students may have.

*Though the whole-group cloud to faucet to drain diagram may be visible to students during this activity, it can serve a helpful tool to prompt student thinking. While directly drawing students’ attention to it may lead the class to rely too heavily on it as they complete this activity, leaving the poster up in the room can serve as a reminder to students about the ideas they explored throughout these lessons.

Using the ICE rubric to comparing student work from pre-assessment diagrams to the diagrams students produce as a post-assessment can be useful in tracking how student ideas develop over time. This rubric can be used to better understand how the depth and quality of student understanding have evolved in relation to how students are able to communicate their ideas of how water moves underground.

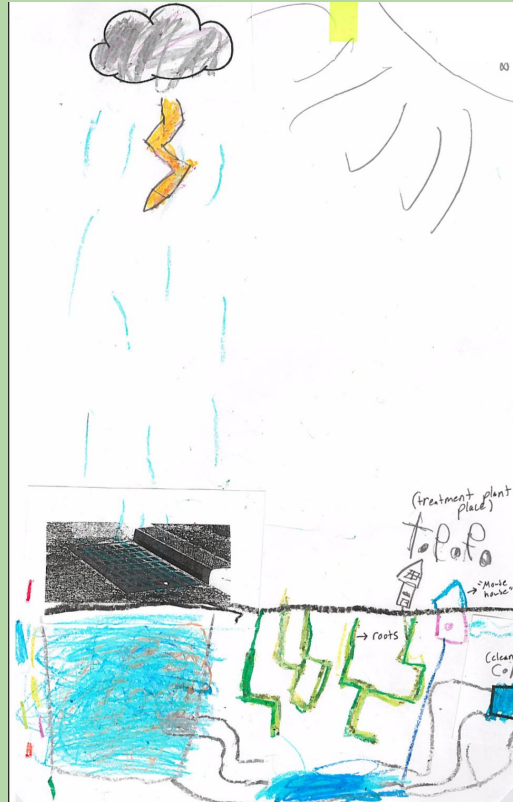
Pre-Assessment Making Thinking Visible Diagram Example



In the pre-assessment diagram task students worked in partners. In this example piece, the partners created visual representations of water traveling through pipes, used arrows to represent the movement of this water from a cloud into a storm drain, and depicted pipes carrying this water to two faucets in one direction and into a larger body of water in the other direction. Here, these students have made the connection that drains transport water and students are anticipating outcomes based on their existing knowledge.

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Post-Assessment Making Thinking Visible Diagram Example



In the post-assessment diagram, completed by the same partner students, there are identifiable aspects that demonstrate how student thinking has evolved and become more complex. In this diagram, students added to their original ideas, still showing their thinking that pipes are used to transport water, but now students included labels about ‘clean’ water coming out of the faucet and included a ‘treatment plant place’ to “make the dirty water clean again.” These ideas align with the ‘Extensions’ of the ICE rubric, as student thinking has evolved to include a transfer of student knowledge and prior experiences with drains and water to create models that represent these ideas in context.

Equivalent Scenario Activity: What are students thinking now?

In order to gauge individual student levels of understanding following the conclusion of the Inquiry Inc. story and corresponding lessons, a scenario question asking students to consider similar big ideas about water and how water travels underground can be used.

After the Inquiry Inc. story and lessons have wrapped up, ask students a scenario question. There is a rubric provided that you may choose to use as you consider an individual student’s understanding through their responses to the scenario question. This information can then be used to inform future instruction with students about ideas of water and how it travels.

Provide them with paper to draw and write their ideas.

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Will Ellen Get Her Car Keys Back?

Use the provided [images](#) to help lead students through the story. When reading the scenario, show students the first four slides and leave them on display as students work through their thinking. Then, during the whole group discussion, show students the remaining photos detailing how the keys were really rescued.

One day, Ellen drove to a coffee shop to get coffee. As she was getting out of her car, she dropped her car keys into a drain that was next to her parked car.

Using what you know about drains and water, where could the keys have gone? Could Ellen get her keys back?

Use this paper to draw and write your ideas about where the keys went and how Ellen could solve this problem to get her keys back. What tools might she need to use?

*After students have recorded their thinking through drawings, sketches, and labels, have a short whole group discussion about ideas they have, then show the rest of the slideshow

OR

Will Silvia Get Her Pencil Back?

*Use the final page of *Inquiry Inc and the Case of the Missing Ducklings* as a visual for students when reading through the scenario and leave this image on display as students work through their thinking.*

Think about Anna's question at the end of the story. Anna was lying in her bed thinking about when Silvia's pencil accidentally fell into the drain. "I wonder where Silvia's pencil ended up," Anna thinks to herself. Using what you know about drains and water, where could Silvia's pencil have ended up? Could Silvia get her pencil back?

Use this paper to draw and write your ideas about where the pencil went. What tools might Silvia need to use to get her pencil back?

*After students have recorded their thinking, have a short whole group discussion about ideas they have.

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ICE Rubric: Noticing progressions in student thinking

This rubric can be used to consider individual and group student understanding of concepts about water based on the exploration students have done through the *Inquiry Inc.* story and lessons.

The ICE framework is adapted from *Natural Curiosity*,² to align with the big ideas and learning goals of the *Inquiry Inc and the Case of the Missing Ducklings* curriculum and relevant standards from Next Generation Science Standards, linked throughout the rubric.³

Individual Thinking			
Elements	Ideas	Connections	Extensions
<i>Knowledge and Understanding of Water and its Movement (sketches, drawings, and labels)</i>	<ul style="list-style-type: none"> -Students are able to ask questions based on observations to find more information about the natural/designed world in relation to water and its movement (K-2-ETS1-1) -Students are able to recognize that water travels downhill and travels through pipes underground that connect drains 	<ul style="list-style-type: none"> -Students are able to identify the purpose of drains as a human-created solution to collect and transport water (K-2-ETS1-1) -Students are able to apply their understanding of drains to infer where water goes after it enters a drain. 	<ul style="list-style-type: none"> -Students are able to transfer situational knowledge about water and drains to related concepts and situations, anticipating the outcomes based on their knowledge -Students are able to build on prior experiences and progress to develop models (diagrams, drawings, physical replicas, etc.) that represent events, ideas, or design solutions (K-2-ETS1-2)
Group Discourse			
Elements	Ideas	Connections	Extensions
<i>Communication of Water and its Movement (descriptions of processes, expression of ideas)</i>	<ul style="list-style-type: none"> -Students are able to describe their ideas about how water moves underground, supported by evidence 	<ul style="list-style-type: none"> -Students are able to describe verbally how water travels and illustrate this process through drawings/diagrams as well 	<ul style="list-style-type: none"> -Students can analyze design choices, comparing and testing design choices (K-2-ETS1-3) - Students are able to use data from tests of an object or tool to determine if it works as intended (K-2-ETS1-3)

² Lorraine Chiarotto, *Natural Curiosity: A Resource for Teachers*, 1st ed., 2011.

³ “Next Generation Science Standards,” accessed May 2, 2019, <https://www.nextgenscience.org/>.

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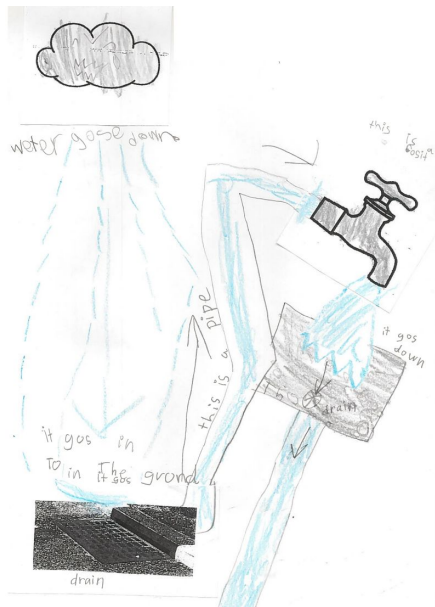
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Student Work Examples: When using the ICE Rubric to consider student work it may be helpful to think about examples within these categories in relation to assessment tools for this series of lessons. This matrix demonstrates some examples of ‘evidence’ that may be present in student work that can be used to evaluate and compare student learning and growth throughout the lessons using this rubric.

Ideas may be revealed when students describe:

Basic Facts/ Fundamentals:

- 1st grade example: Demonstrating that water travels from clouds into drains, faucets, and bodies of water
- 1st grade example: Uses arrows, alignment of images, and labels to demonstrate the movement/cycle of water.



Vocabulary/Elemental Concepts:

- 1st grade example: Identifying and denoting ‘clean’ and ‘dirty’ water.



- 1st grade example: “We need drains, because, without them, there would be no place for water to go. The streets and houses would flood.”
- 1st grade example: “I’m not sure, but I think too much trash and big leaves would clog a drain.”

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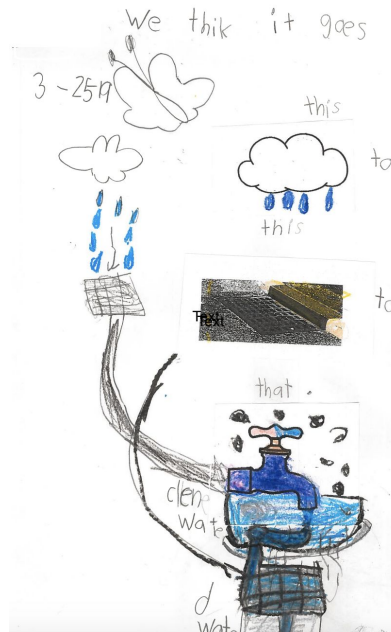
Connections may be drawn when students:

Explain a relationship or connection between new learning and what they already know:

- 1st grade example: "I never thought so much about drains! Now I see them and wonder what is down there."

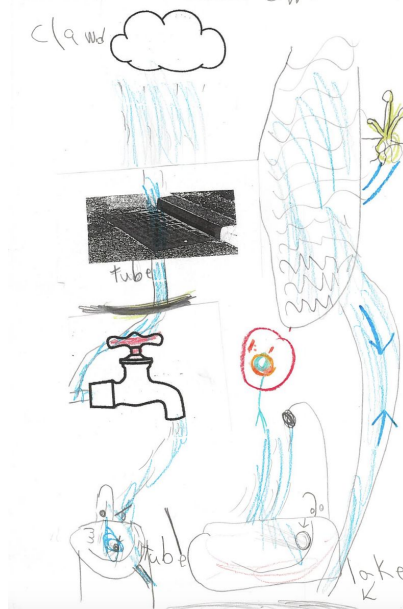
Explain the relationship or connection among the basic concepts:

- 1st grade example: Student outlines the progression of water traveling, "We think it goes like this (cloud) to this (drain) to this (faucet)."



Uses phrases like, "Oh, this reminds me of..." or "That's just like..."

- 1st grade example: Inclusion of a sink, shower, and person using water in the cycle.

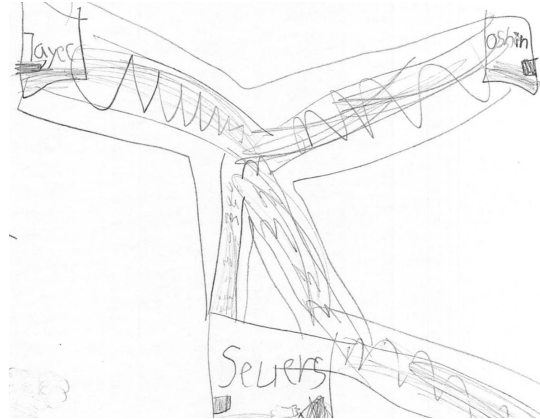


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Extensions may be revealed when students:

Apply their new learning in novel ways:

- 1st grade example: Student outlines the connection of drains underground, flowing to three different water sources (sewers, lake, ocean)



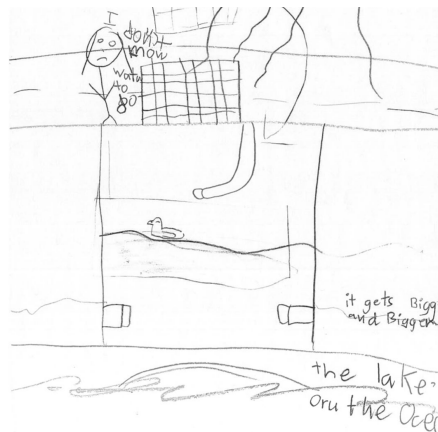
Explain what others can do:

- 1st grade example: Student includes the images of characters thinking about possible solutions



Answer conjectural questions such as: “So, what does this mean? How does this shape my world?”:

- 1st grade example: Observing pipes in a drain, and then including the pipes in a drawing, extrapolating that the pipes carry the water away when the drain fills, “It gets bigger and bigger,” getting to, “the lake or the ocean.”



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References:

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