TABLE 1

Adapted from *NGSS* Appendix F: Scientific and engineering practices, K–2 grade band.

SCIENTIFIC AND ENGINEERING PRACTICES	OBSERVED EXAMPLES	SETTING THE STAGE
1. Asking questions (for science) and defining problems (for engineering)	Students notice that sand is heavier after rain. They ask a teacher why it is heavier.	The play space is designed so that children can access sand and dirt in varied weather and states.
2. Developing and using models	Students use string and a wooden box to make an imaginary sailboat. They run out of string and decide to use a stick instead to "raise the sail."	Heuristic play encourages the use of "loose parts" or familiar and non-directive materials. Children will often turn to creative solutions and further investigations when they have few "assigned" toys (e.g., dump truck, dinosaur, replica fruit) to access.
3. Planning and carrying out investigations	Students explore a "seesaw" they made by placing a board over a fallen log. One child tries to push his end down while another child is standing on the opposite end. The first child can't force her end down until the second child steps off. The second child exclaims, "Woah! I didn't see that coming!" as her end of the seesaw pops up behind her after he steps off (see Figure 2).	Materials for building large structures are available and stored to encourage children's investigation and use. The ramps, stumps, and long beams that children use to create a ramp or a seesaw are part of their everyday play.
4. Analyzing and Interpreting Data	A student discovers that sand pours out of one container more quickly because it has more holes through which the sand can fall. The same student notices that some sand is too damp to pour out of the can. She samples sand from several different locations around her.	Materials available to students for their investigations includes cups, buckets, and other familiar items. A sieve, colander, or flour dredger can be used to shake and filter sand.
5. Using mathematics and computational thinking	Students pull each other in a sled using a rope. They note that when there are lots of children in the sled, it is harder to pull them. When a few students get out to help pull, they observe that the string gets very tight, but the sled still won't move. One student exclaims, "It is too heavy!"	Weather and seasonal shifts offer a changing landscape for play. The use of a sled in snow, ice, and water offers children the opportunity to count and to consider size, weight, and force.
6a. Constructing explanations (science)	Students experiment with running up and down a hill. They note that they can run faster downhill. They propose that one should "run harder" when going uphill.	Hills, berms, and uneven ground allow for rich exploration. The opportunity to go up an incline and then down offers students a chance to experience and build an embodied understanding of momentum.
6b. Designing solutions (engineering)	Students are walking on a "bridge" made with planks on stools when they realize it's not "smooth" because the stools are uneven. One child suggests they take the planks off to fix this. They do so and this child leads the group, putting the bridge back together.	The materials available for play are varied in size, shape, and texture so that children have opportunities to design solutions (collaboratively or independently) for problems they identify.
7. Engaging in argument from evidence	Students are digging in the dirt when one holds up something shiny and declares, "I found a crystal!" A second student counters, "No it's not. It's just mica." The first student responds, "Well, mica is a kind of crystal." The second student examines the rock, peeling off layers before concluding, "Yep. This is	A variety of materials are accessible to children throughout the day. They are given flexibility and agency over where and how they use these materials so that they can collect data, construct explanations from evidence, and engage in argument with their peers.
8. Obtaining, evaluating and communicating information	Students describe their garden and explain that it's time to put the plants "to bed" because they're done growing but they will grow again next year.	Gardens offer experiences in stability and change as well as opportunities where children can examine plant parts. In the preschool program, children notice shifting seasons and make observations related to those changes.

TABLE 2

Scientific and engineering practices: Examples and environmental stage-setting.

SCIENTIFIC AND ENGINEERING PRACTICES	OBSERVED EXAMPLES	SETTING THE STAGE
1. Asking questions (for science) and defining problems (for engineering)	Students notice that sand is heavier after rain. They ask a teacher why it is heavier.	The play space is designed so that children can access sand and dirt in varied weather and states.
2. Developing and using models	Students use string and a wooden box to make an imaginary sailboat. They run out of string and decide to use a stick instead to "raise the sail."	Heuristic play encourages the use of "loose parts" or familiar and non-directive materials. Children will often turn to creative solutions and further investigations when they have few "assigned" toys (e.g., dump truck, dinosaur, replica fruit) to access.
3. Planning and carrying out investigations	Students explore a "seesaw" they made by placing a board over a fallen log. One child tries to push his end down while another child is standing on the opposite end. The first child can't force her end down until the second child steps off. The second child exclaims, "Woah! I didn't see that coming!" as her end of the seesaw pops up behind her after he steps off (see Figure 2).	Materials for building large structures are available and stored to encourage children's investigation and use. The ramps, stumps, and long beams that children use to create a ramp or a seesaw are part of their everyday play.
4. Analyzing and Interpreting Data	A student discovers that sand pours out of one container more quickly because it has more holes through which the sand can fall. The same student notices that some sand is too damp to pour out of the can. She samples sand from several different locations around her.	Materials available to students for their investigations includes cups, buckets, and other familiar items. A sieve, colander, or flour dredger can be used to shake and filter sand.
5. Using mathematics and computational thinking	Students pull each other in a sled using a rope. They note that when there are lots of children in the sled, it is harder to pull them. When a few students get out to help pull, they observe that the string gets very tight, but the sled still won't move. One student exclaims, "It is too heavy!"	Weather and seasonal shifts offer a changing landscape for play. The use of a sled in snow, ice, and water offers children the opportunity to count and to consider size, weight, and force.
6a. Constructing explanations (science)	Students experiment with running up and down a hill. They note that they can run faster downhill. They propose that one should "run harder" when going uphill.	Hills, berms, and uneven ground allow for rich exploration. The opportunity to go up an incline and then down offers students a chance to experience and build an embodied understanding of momentum.
6b. Designing solutions (engineering)	Students are walking on a "bridge" made with planks on stools when they realize it's not "smooth" because the stools are uneven. One child suggests they take the planks off to fix this. They do so and this child leads the group, putting the bridge back together.	The materials available for play are varied in size, shape, and texture so that children have opportunities to design solutions (collaboratively or independently) for problems they identify.

TABLE 3

A framework for supporting scientific and engineering practices in play.

OBSERVE	REFLECT	SET THE STAGE	CONNECT
Student asks, "Why are all the leaves turning yellow?" (P1 / P4)	How can I create more opportunities for these types of questions and observations?	Provide baskets or tins for collecting leaves; set out paper and crayons so students can draw what they observe; Articulate the science (e.g., "You made an observation about the leaves" or "I wonder what other things are changing as the weather gets cooler?"	Let children share their drawings and observations; Make leaf rubbings together; Read a story about trees or changing seasons (e.g., *It's Fall!* By Linda Glaser; *Leaf Man* by Lois Ehlert)
Children excitedly announce, "It's raining!" or "It's snowing!"	How can I help children to investigate water in all of its forms?	Provide scoops, shovels, and buckets for water play. Make sure children have rain gear/ snow gear so they will be comfortable outside in wet conditions	Help students to water plants or an outside garden; Ask them what they notice about rain or snow. Read a story about water (e.g., *All the Water in the World* by George Ella Lyon and Katherine Tillotson or *Come on, Rain!* by Karen Hesse with pictures by Jon J. Muth)