**Formative Assessment Probes- Promoting Learning through Assessment**

*Science & Children* Journal

A monthly column by Page Keeley

Articles that can be used to support individual teacher learning, supplement professional development topics, or engage PLC’s in discussions about teacher practice and student thinking

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| **Date** | **Title** | **Topic** |
| 1.  Sept 2010 | *Doing Science*  Probe: Doing Science | “Scientific method”; examine how misuse of the “scientific method” impacts students’ ideas about science |
| 2.  Oct 2010 | *“More A- More B” Rule*  Probe: Floating Log | Floating and Sinking; use of intuitive rules to reason about floating and sinking |
| 3.  Nov 2010 | *Does It Have a Life Cycle?*  Probe: Does It Have a Life Cycle? | Life cycles; addressing the limitations of context in the curriculum |
| 4.  Dec 2010 | *To Hypothesize or Not*  Probe: What Is a Hypothesis? | Hypotheses; revealing misconceptions teachers have about the nature of science that can be passed on to students |
| 5.  Jan 2011 | *How Far Did It Go?*  Probe: How Far Did It Go? | Linear measurement; difficulties students have with measurement particularly with a non-zero starting point |
| 6.  Feb 2011 | *Needs of Seeds*  Probe: Needs of Seeds | Needs of living things; engaging in evidence-based argumentation |
| 7.  Mar 2011 | *The Mitten Problem*  Probe: The Mitten Problem | Energy transfer, insulators; teaching for conceptual change and how children’s everyday experience affects their thinking |
| 8.  Apr 2011 | *Is It Living?*  Probe: Is It Living? | Characteristics of living things; examine ways to uncover “hidden meanings” students have for some concepts |
| 9.  Jul 2011 | *With a Purpose*  Probe: Several | A variety of probes and techniques show purposeful links to various stages in an assessment, instruction, and learning cycle |
| 10.  Sept 2011 | *Where Are the Stars?*  Probe: Emmy's Moon and Stars | Solar system, relative distances; impact representations in books and other media have on children’s ideas |
| 11.  Oct 2011 | *Pushes and Pulls*  Probe: Talking About Forces | Forces; examining common preconceptions and use of language to describe forces and motion |
| 12.  Nov 2011 | *Teachers as Researchers*  Probe: Is It an Animal? | Biological concept of an animal; How formative assessment probes can be used to engage in teacher action research |
| 13.  Dec 2011 | *Representing Microscopic Life*  Probe: Pond Water | Single-celled organisms; use of representations to examine students’ ideas |

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| 14.  Jan 2012 | *Daytime Moon*  Probe: Objects in the Sky | Objects in the sky; examines reasons why children still hold on to the strongly held belief that the moon is visible only at night |
| 15.  Feb 2012 | *Can It Reflect Light?*  Probe: Can It Reflect Light? | Reflection; addressing students preconceptions with firsthand experiences that support conceptual change |
| 16. Apr/May 2012 | *Food for Plants- A Bridging Concept*  Probe: Is It Food for Plants? | Food, photosynthesis, needs of plants; using bridging concepts to address gaps in learning goals |
| 17.  Jul 2012 | *Where Did the Water Go?*  Probe: Where Did the Water Come From? | Condensation, Evaporation; linking concepts, practices, and cross-cutting concepts |
| 18.  Sept 2012 | *Confronting Common Folklore- Catching a Cold*  Probe: Catching Cold | Infections diseases; understanding how "old wives' tales" and common folklore affect student thinking |
| 19.  Oct 2012 | *Talking About Shadows*  Probe: Me and My Shadow | Sun-Earth movement and patterns; using talk moves and establishing a culture of productive talk using friendly talk probes |
| 20.  Nov 2012 | *Birthday Candles- Visually Representing Ideas*  Probe: Birthday Candles | Light, movement of light; using children's drawings to probe for and understand their thinking |
| 21.  Dec 2012 | *Mountain Age- Creating a Classroom Profile*  Probe: Mountain Age | Weathering, landforms; using a classroom profile to analyze and group student responses in order to address commonly held ideas |
| 22.  Jan 2013 | *Using the P-E-O Technique*  Probe: Solids and Holes | Floating and sinking, density; having students predict, provide initial explanations for their predictions, then observe the phenomenon and develop new explanation |
| 23.  Feb 2013 | *Labeling vs. Explaining*  Probe: Chrysalis | Life cycles, concept of living; labeling diagrams with vocabulary words does not always reveal what students really think about a phenomenon |
| 24.  Mar 2013 | *When Equipment Gets in the Way*  Probe: Battery, Bulb, and Wires | Battery, bulb, complete circuit; when learning gets lost in equipment that "does the work" for students |
| 25.  Apr 2013 | *Is It a Rock? Continuous Formative Assessment*  Probe: Is It a Rock? | Rock, properties of rocks; how assessment is used throughout an instructional cycle from elicitation to reflection |
| 26. Jul 2013 | *Is It a Solid? Claim Cards and Argumentation*  Probe: Is It a Solid? | Solids, liquids; how the technique of claim cards is used to surface students' ideas and engage them in the practice of argumentation using claims and evidence |
| 27.  Sept 2013 | *When Is the Next Full Moon? Using K-2 Concept Cartoons*  Probe: When Is the Next Full Moon? | Moon phases, patterns; how concept cartoons are used to elicit students' ideas and launch into purposeful investigations |
| 28.  Oct 2103 | *Pendulums and Porch Swings- Connecting Science and Engineering*  Probe: Swinging Pendulum | Patterns of motion, engineering design; how knowledge from a science investigation is used to solve an engineering problem. |
| 29.  Nov 2103 | *Is It Melting? Formative Assessment for Teacher Learning*  Probe: Is It Melting? | Melting, dissolving; how formative assessment probes can be used in a professional development setting to challenge teachers' ideas and work through them |

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| 30.  Dec 2013 | *Is It Made of Parts?- Scaffolding a Formative Assessment Probe*  Probe: Is It Made of Parts? | Parts of organisms; identifying sub-ideas in a learning goal and using a probe to elicit these ideas while scaffolding instruction and assessment |
| 31.  Jan 2014 | *Assessment for All*  Probe: Where Do People Live?  Big and Small Seeds | Equity, cultural responsive assessment; formative assessment that reflects diversity in the classroom and addresses English language learners |
| 32.  Mar 2014 | *Habitat Change: Formative Assessment of a Cautionary Word*  Probe: Habitat Change | Adaptation; how students/ every day, colloquial use of a word affects their understanding of the scientific use of s word |
| 33.  Sept 2014 | *Is It a Theory- Speaking the Language of Science*  Probe: Is It a Theory? | Theory; how students distinguish scientific theories from the every day use of the word theory and the difference between theories and laws |
| 34.  Nov 2014 | *Seeds in a Bag*  Probe: Seeds in a Bag | Needs of seeds, germination; Use of cause and effect crosscutting concept with seed germination |
| 35.  Dec. 2014 | *Watermelon and Grape- An Intuitive Rule of Quantity and Proportion*  Probe: Watermelon and Grape | Sink and float; how the "More A-More B" intuitive rule affects children's ideas about sinking and floating |
| 36.  Jan 2015 | *Ice Cubes in a Bag*  Probe: Ice Cubes in a Bag | States of matter, phase change, conservation of matter; uncovering students' ideas about open and closed systems |
| 37.  Mar 2015 | *Soil and Dirt- Same or Different*  Probe: Describing Soil | Soil; uncovering students' ideas about properties of soil and whether soil and dirt are the same |
| 38.  Jul 2015 | *Snap Blocks*  Probe: Snap Blocks | Parts and wholes, conservation of matter; uncovering whether students recognize that an object made of pieces weighs the same when it is taken apart |
| 39.  Sept 2015 | *Where Do I Put the Switch?*  Probe: Where Do I Put the Switch? | Circuits; using formative assessment probes during engineering design activities |
| 40.  Oct 2015 | *Wet Jeans*  Probe: Wet Jeans | Evaporation, water cycle; using familiar phenomena to uncover students' thinking |
| 41.  Nov 2015 | *Constructing Cl-Ev-R Explanations to Formative Assessment Probes*  Probe: Lemonade | Conservation of matter, dissolving; using claims, evidence, and reasoning to explain what happens to the weight when sugar is dissolved in water |
| 42.  Dec 2015 | *Mountaintop Fossil- A Puzzling Phenomenon*  Probe: Mountaintop Fossil | Mountain formation, fossils; uncovering students' ideas about how marine fossils can be found on the tops of tall mountains |
| 43.  Jan 2016 | *Uncovering Students' Concept of Matter*  Probe: Is It Matter? | Matter; uncovering young children's ideas about the types of objects, materials, and substances they consider to be matter |
| 44.  Mar 2016 | *Is It Erosion or Weathering?*  Probe: Is It Erosion? | Erosion, weathering, deposition; using a probe before introducing terminology |
| 45.  Apr 2016 | *Talk Moves*  Probe: Watermelon and Grape | Sinking and floating; Using talk moves with probes to engage students in productive science discussions |

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| 46.  Jul 2016 | *Big and Small Seeds*  Probe: Big and Small Seeds | Germination; showing how a formative assessment probe supports the scientific practices |
| 47.  Sept 2017 | *Pre-service Teachers' Ideas about Magnetism & Formative Assessment*  Probe: Can You Pick It Up? | Magnetism, formative assessment; how formative assessment probes uncover new teachers' ideas and help them understand the role of formative assessment |
| 48.  Oct 2017 | *Uncovering Young Children's Concept of a Plant*  Probe: Is It a Plant? | Plants; how formative assessment reveals commonly held ideas children have about plants |
| 49.  Nov 2017 | *Vocabulary in Context- Is It an Amphibian?*  Probe: Is It an Amphibian? | Amphibian, structure and function; how context affects how children interpret vocabulary |
| 50.  Dec. 2017 | *Embedding Formative Assessment into the 5E Model*  Probe: Lemonade | Conservation of matter, dissolving; how different formative assessment classroom techniques (FACTs) are used throughout an instructional cycle |
| 51.  Jan. 2018 | *Uncovering Representations of the Water Cycle*  Probe: Wet Jeans | Water, cycle, evaporation; examining how representations affect students' understanding of the water cycle |
| 52.  Feb. 2018 | *Uncovering Students' Ideas about Inherited Traits*  Probe: Baby Mice | Heredity, inherited traits; eliciting students' initial ideas about how they look similar to and different from their parents |
| 53.  Mar. 2018 | *Uncovering "Maker" Ideas About Sound*  Probe: Making Sound | Sound, vibrations; How maker activities can (and sometimes do not) support content learning |
| 54.  April 2018 | *Uncovering Students' Ideas about Watersheds*  Probe: What Is a Watershed? | watershed; how a formative assessment probe reveals students' initial concept of a watershed |
| 55.  July  2018 | *Using Formative Assessment Probes to Develop Elementary Learning Stations*  Probe: Can You Pick It Up with a Magnet? | Magnetism; how to set up learning stations for formative assessment |
| 56.  Aug. 2018 | *Formative Assessment Probes- Is a Brick a Rock?*  Probe: Is a Brick a Rock? | Human made-vs. natural made materials, natural resources. Using the “lines of agreement” argumentation strategy. |
| 57.  Nov. 2018 | *Magnets in Water- Using a TLR Scaffold to Support Productive Talk and Careful Listening*  Probe: Magnets in Water | Magnetism, magnetic interaction. Using a Talk-Listen-Restate scaffold during probe discussions. |
| 58.  Jan. 2019 | *Apple in the Dark- Formative Assessment Probes and Metacognition*  Probe: Apple in the Dark | Light, vision. Using metacognitive strategies to support thinking. |
| 59.  Feb. 2019 | *Balance Beam- Figuring Out a Mathematical Rule*  Probe: Balance Beam | Force, balanced forces, Using a mathematical rule to balance a balance beam. |
| 60.  Mar. 2019 | *Describing the Motion of a Marble- Staying True to the Purpose of a Formative Assessment Probe*  Probe: Marble Roll | Position, motion, describing motion; observing a phenomenon to develop the language of motion rather than explaining the phenomenon which is the goal in later grades. |

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| 61.  Apr. 2019 | *Formative Assessment Probes- Our Best Thinking So Far*  Probe: Can a Plant Break Rocks? | Weathering, mechanical weathering; changing your language from “right”, “correct”, or “wrong” answers to “our best thinking so far” or the “best answer” |
| 62.  Aug 2019 | *Supporting Literacy Capacities of Speaking and Listening*  Probe: Solids, Liquids, and Gases | States of matter, properties of matter; using probes in discussion formats to support speaking and listening skills |
| 63.  Sept 2019 | *Using the 6Es and Formative Assessment Probes to Differentiate Instruction*  Probe: No Shadow | Shadows, Earth-Sun system; how inserting an additional E into the 5E model provides for differentiated instruction based on students’ ideas. |
| 64.  Nov 2019 | *Using Probes for Constructive Conversations*  Probe: Where Did the Sun Go? | Sun-Earth system, day-night cycle; focus on supporting productive probe discussions |
| 65.  Feb 2020 | *Doing Science vs. Doing Engineering*  Probes: Doing Science, How Engineers Do Their Work | Scientific investigations, engineering design; addresses the similarity between the common misuse of “the” scientific method and “the” engineering design process. |
| 66.  Apr/May 2020 | *Uncovering Parents’ and Children’s Ideas About Science*  Probe: Shadow Size | Light, shadows; how parents and children can use probes together to investigate phenomena. |
| 67.  Sept/Oct  2020 | *Using Formative Assessment Probes with Real or Virtual Field Trips*  Probe: Land or Water? | Water distribution on Earth; focus on how probes can be used to complement museum exhibits and field trips. |
| 68.  Nov/Dec  2020 | *The Day-Night Cycle- Adding Models to Probe Explanations*  Probe: What Causes Day and Night? | Day/night cycle, Earth’s rotation; focus on how drawings are used as models to support explanations. |
| 69.  Jan/Feb  2021 | *What Is Brainstorming?*  Probe:  Brainstorming | Engineering design process, brainstorming; focus on how brainstorming is used by engineers and suggestions for developing guidelines for brainstorming based on students’ ideas about the process of brainstorming. |