**Guide to Linking *Uncovering Student Ideas* Physical Science Probes to Disciplinary Core Ideas in the *Framework and the NGSS***

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| **Disciplinary Core Idea** | **Probe and USI Book Cod** | **Grade Span Connection** |
| PS1.A Structure and Properties of Matter | Sink or Float? (USI K-2, 2013) | Related K-2 |
| Watermelon and Grape (USI K-2, 2013) | Related K-2 |
| Is It Matter? (USI K-2, 2013) | Related K-2 |
| Snap Blocks (USI K-2, 2013) | Related K-2 |
| Ice Cubes in a Bag (USI V1, 2005, 2019) | Aligned 3-5; Related 6-12 |
| Lemonade (USI V1, 2005, 2019) | Aligned 3-5; Related 6-12 |
| Cookie Crumbles (USI V1, 2005, 2019) | Aligned 3-5 |
| Is It Melting? (USI V1, 2005, 2019) | Related 3-12 |
| Is It Matter? (USI V1, 2005, 2019) | Related 3-12 |
| Is It Made of Molecules? (USI V1, 2005, 2019) | Related 6-12 |
| Wet Jeans (USI V1, 2005, 2019) | Related 3-12 |
| Comparing Cubes (USI V2 2007) | Related 6-12 |
| Floating Logs (USI V2 2007) | Related 3-12 |
| Floating High and Low (USI V2 2007) | Related 3-8 |
| Solids and Holes (USI V2 2007) | Related 6-12 |
| Turning the Dial (USI V2 2007) | Related 6-12 |
| Boiling Time and Temperature (USI V2 2007) | Related 6-12 |
| Freezing Ice (USI V2 2007) | Related 6-12 |
| What’s in The Bubbles? (USI V2 2007) | Related 3-5; Aligned 6-8 |
| Chemical Bonds (USI V2 2007) | Related 6-12 |
| Pennies (USI V3 2008) | Related 6-12 |
| Is It a Solid? (USI V3 2008) | Aligned K-2; Related 3-8 |
| Thermometer (USI V3 2008) | Aligned 6-8; Related 9-12 |
| Floating Balloon (USI V3 2008) | Related, 3-5; Aligned 6-8 |
| Hot and Cold Balloons (USI V3 2008) | Aligned 6-8; Related 9-12 |
| Sugar Water (USI V4 2009) | Related 6-12 |
| Iron Bar (USI V4 2009) | Related 6-12 |
| Salt Crystals (USI V4 2009) | Aligned 6-8; Related 9-12 |
| Pizza Dough (USI PSV1, 2010) | Related 6-12 |
| Weighing Water (USI PSV1, 2010) | Related K-5 |
| Matter or Not Matter? (USI PSV3, 2019) | Related 3-8 |
| Solids, Liquids, and Gases (USI PSV3, 2019) | Related 3-8 |
| What Do You Know About Atoms and Molecules? (USI PSV3, 2019) | Related 6-12 |
| Atoms and Apples (USI PSV3, 2019) | Related 6-12 |
| Model of Air Inside a Jar (USI PSV3, 2019) | Related 3-5; Aligned 6-8 |
| What If You Could Remove All the Atoms? (USI PSV3, 2019) | Related 6-12 |
| Do They Have Weight and Take Up Space? (USI PSV3, 2019) | Related 3-8 |
| What Does “Conservation of Matter” Mean? (USI PSV3, 2019) | Related 3-8 |
| Squished Bread (USI PSV3, 2019) | Related 6-12 |
| Mass, Volume, and Density (USI PSV3, 2019) | Related 6-12 |

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| PS1.A (continued) | Measuring Mass (USI PSV3, 2019) | Related 6-12 |
| Do They Have the Same Properties? (USI PSV3, 2019) | Related 6-12 |
| Are They the Same Substance? (USI PSV3, 2019) | Aligned 6-8; Related 9-12 |
| Classifying Water (USI PSV3, 2019) | Related 6-12 |
| Graphite and Diamonds (USI PSV3, 2019) | Related 9-12 |
| Neutral Atoms (USI PSV3, 2019) | Aligned 9-12 |
| What Is a Substance? (USI PSV3, 2019) | Related 6-12 |

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| PS1.B Chemical Reactions | Ice Cubes in a Bag (USI V1, 2005, 2019) | Aligned 3-5; Related 6-12 |
| Lemonade (USI V1, 2005, 2019) | Aligned 3-5; Related 6-12 |
| Cookies Crumbles (USI V1, 2005, 2019) | Related 3-5 |
| Seedlings in a Jar (USI V1, 2005, 2019) | Aligned 6-8; Related 9-12 |
| The Rusty Nails (USI V1, 2005, 2019) | Related 6-8; Aligned 9-12 |
| Wet Jeans (USI V1, 2005, 2019) | Related 3-8 |
| Burning Paper (USI V4 2009) | Aligned 6-8; Related 9-12 |
| Nails in a Jar (USI V4 2009) | Aligned 6-8; Related 9-12 |
| Salt in Water (USI PSV3, 2019) | Aligned 3-5; Related 6-8 |
| Will It Form a New Substance? (USI PSV3, 2019) | Related 3-5; Aligned 6-12 |
| What Is the Result of a Chemical Change? (USI PSV3, 2019) | Related 3-5; Aligned 6-12 |
| What Happens to Atoms During a Chemical Reaction? (USI PSV3, 2019) | Aligned 6-12 |
| Is It a Chemical Change? (USI PSV3, 2019) | Related 3-5; Aligned 6-12 |
| Does It Have New Properties? (USI PSV3, 2019) | Aligned 3-5; Related 6-12 |
| Energy and Chemical Bonds (USI PSV3, 2019) | Aligned 9-12 |
| Back and Forth (USI K-2, 2013) | Aligned K-2 |

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| PS1.C Nuclear Processes | Are They Safe to Eat? (USI PSV3, 2019) | Related 9-12 |
| Radish Seeds (USI PSV3, 2019) | Related 9-12 |

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| PS2.A Forces and Motion | Marble Roll (USI K-2, 2013) | Related K-2 |
| Apple on a Desk (USI V3 2008) | Aligned 3-5; Related 6-8 |
| Rolling Marbles (USI V3 2008) | Related 3-8 |
| Dropping Balls (USI V3 2008) | Related 6-12 |
| How Far Did It Go? (USI PSV1, 2010) | Related 3-5 |
| Skate Park (USI PSV1, 2010) | Related 6-12 |
| Following Jack, Part 1 (USI PSV1, 2010) | Related 6-12 |
| Following Jack, Part 2 (USI PSV1, 2010) | Related 6-12 |
| Go Cart Test Run (USI PSV1, 2010) | Related 6-12 |
| Checking the Speedometer (USI PSV1, 2010) | Related 6-12 |
| Speed Units (USI PSV1, 2010) | Related 6-12 |
| Just Rolling Along (USI PSV1, 2010) | Related 6-12 |
| Crossing the Finish Line (USI PSV1, 2010) | Related 9-12 |
| NASCAR Racing (USI PSV1, 2010) | Related 6-12 |
| Roller Coaster Ride (USI PSV1, 2010) | Related 6-12 |
| Rolling Marbles (USI PSV1, 2010) | Related 3-8 |
| Talking About Forces (USI PSV1, 2010) | Aligned K-5 |
| Force and Motion Ideas (USI PSV1, 2010) | Related 3-12 |
| A World Without Friction (USI PSV1, 2010) | Related 6-12 |
| Outer Space Push (USI PSV1, 2010) | Related 6-12 |
| Riding in the Parade (USI PSV1, 2010) | Related 6-12 |
| Spaceships (USI PSV1, 2010) | Related 6-12 |
| Ball on a String (USI PSV1, 2010) | Related 6-12 |
| Why Things Fall (USI PSV1, 2010) | Related 6-8; Aligned 9-12 |

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| PS2.A (continued) | Pulling on a Spool (USI PSV1, 2010) | Aligned 9-12 |
| Lifting Buckets (USI PSV1, 2010) | Aligned 9-12 |
| Finger Strength Contest (USI PSV1, 2010) | Aligned 6-8; Related 9-12 |
| Equal and Opposite (USI PSV1, 2010) | Aligned 6-8, Related 9-12 |
| Riding in a Car (USI PSV1, 2010) | Related 6-12 |
| Free Falling Objects (USI PSV1, 2010) | Related 6-8; Aligned 9-12 |
| Pulley Size (USI PSV1, 2010) | Related 6-12 |

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| PS2.B Types of Interactions  | Big and Small Magnets (USI K-2, 2013) | Related K-2 |
| Talking About Gravity (USI V1, 2005, 2019) | Related 3-12 |
| Batteries, Bulbs, and Wires (USI V3 2008) | Related 3-8 |
| Standing on One Foot (USI V4 2009) | Related 3-8 |
| Magnets in Water (USI V4 2009) | Related 3-8 |
| Does It Have to Touch? (USI PSV1, 2010) | Aligned 3-5; Related 6-8 |
| Friction (USI PSV1, 2010) | Related 3-8 |
| Apple in a Plane (USI PSV1, 2010) | Related 6-12 |
| What Will Happen to the Weight? (USI PSV1, 2010) | Related 3-12 |
| Weighing Water (USI PSV1, 2010) | Related 3-8 |
| Experiencing Gravity (USI PSV1, 2010) | Related 3-12 |
| Apple on the Ground (USI PSV1, 2010) | Aligned 3-5, Related 6-12 |
| Gravity Rocks! (USI PSV1, 2010) | Related 3-8 |
| The Tower Drop (USI PSV1, 2010) | Aligned 3-5; Related 6-8 |
| Do the Objects Need to Touch? (USI PSV2, 2014) | Aligned 3-5 |
| Can It Be Electrically Charged? (USI PSV2, 2014) | Related 6-12 |
| What Happens When You Bring a Balloon Near a Wall? (USI PSV2, 2014) | Related 6-12 |
| Conductors or Insulators? (USI PSV2, 2014) | Related 6-12 |
| Does the Example Provide Evidence? (USI PSV2, 2014) | Related 6-12 |
| Where Can You Find Electric Charge? (USI PSV2, 2014) | Related 6-12 |
| Where Does the Charge Come From? (USI PSV2, 2014) | Related 6-12 |
| How Do You Think About the Flow of Electric Current Through a Circuit? (USI PSV2, 2014) | Related 6-12 |
| How Bright Will the Bulbs Be? (USI PSV2, 2014) | Related 6-12 |
| Which Burns Brighter? (USI PSV2, 2014) | Related 6-12 |
| How Would You Rank the Brightness of These Bulbs? (USI PSV2, 2014) | Related 6-12 |
| How Does the Current in Each Battery Compare? (USI PSV2, 2014) | Related 6-12 |
| Does It Matter if the Wire Has Knots? (USI PSV2, 2014) | Related 6-12 |
| How Fast Do the Charges Move? (USI PSV2, 2014) | Related 6-12 |
| Can Magnets Push or Pull Without Touching? (USI PSV2, 2014) | Aligned 3-5 |
| Can You Pick It Up with a Magnet? (USI PSV2, 2014) | Related 3-8 |
| Does a Magnet Pick Up Any Kind of Metal? (USI PSV2, 2014) | Related 3-8 |

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| PS2.B (continued) | What Happens When You Wrap a Magnet with Aluminum Foil? (USI PSV2, 2014) | Related 3-5, 9-12; Aligned 6-8 |
| What Happens if You Use the Other End of the Magnet? (USI PSV2, 2014) | Related 3-8 |
| Does a Magnet Work Without Air? (USI PSV2, 2014) | Related 3-12 |
| Which One Attracts? (USI PSV2, 2014) | Related 6-12 |
| How Would a Magnet Work on the Moon? (USI PSV2, 2014) | Related 6-12 |
| What Happens When You Hold a Magnet Near a Refrigerator? (USI PSV2, 2014) | Related 6-12 |
| What Happens When a Magnet Is Brought Near a Charged Ball? (USI PSV2, 2014) | Related 6-12 |
| What Makes It Stick? (USI PSV2, 2014) | Related 6-12 |
| What Happens When a Magnet Breaks? (USI PSV2, 2014) | Related 6-12 |
| How Can You Represent a Magnetic Field? (USI PSV2, 2014) | Aligned 6-12 |
| How Can You Magnetize a Nail? (USI PSV2, 2014) | Related 6-12 |
| How Can You Make an Electromagnet? (USI PSV2, 2014) | Related 6-12 |
| Does the Type of Wire Make a Difference in an Electromagnet? (USI PSV2, 2014) | Related 6-12 |
| How Can You Make a Stronger Electromagnet? (USI PSV2, 2014) | Related 6-12 |
| What Happens When You Bring a Compass Near a Current-Carrying Wire? (USI PSV2, 2014) | Related 6-12 |

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| PS3.A Definitions of Energy | The Mitten Problem (USI V1, 2005, 2019) | Related 6-12 |
| Objects and Temperature (USI V1, 2005, 2019) | Related 6-12 |
| Ice Cold Lemonade (USI V2 2007) | Related 6-12 |
| Mixing Water (USI V2 2007) | Related 3-8 |
| Ice Water (USI V4 2009) | Related 6-12 |
| Warming Water (USI V4 2009) | Related 6-12 |
| Gravity Rocks (USI PSV1, 2010) | Aligned 6-8 |
| Lifting a Rock (USI PSV1, 2010) | Related 6-12 |
| Describing Energy (USI PSV3, 2019) | Related 6-12 |
| Matter and Energy (USI PSV3, 2019) | Related 6-12 |
| Which Has More Energy? (USI PSV3, 2019) | Aligned 6-8; Related 9-12 |

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| PS3.B Conservation of Energy and Energy Transfer  | The Mitten Problem (USI V1, 2005, 2019) | Related 3-5; Aligned 6-12 |
| Objects and Temperature (USI V1, 2005, 2019) | Related 6-8; Aligned 9-12 |
| Ice Cold Lemonade (USI V2 2007) | Aligned 6-8; Related 9-12 |
| Mixing Water (USI V2 2007) | Related 3-5; Aligned 6-8 |
| Camping Trip (USI V4, 2009) | Aligned 6-8 |
| One Wire of Two? (USI PSV2, 2014) | Related 3-8 |
| How Can You Light the Bulb? (USI PSV2, 2014) | Related 3-8 |
| Where Do I Put the Switch? (USI PSV2, 2014) | Related 3-8 |
| How Do You Think About the Flow of Electric Current Through a Circuit? (USI PSV2, 2014) | Related 6-12 |
| How Bright Will the Bulbs Be? (USI PSV2, 2014) | Related 6-12 |
| Does the Weight Change? (USI PSV2, 2014) | Related 6-12 |
| Describing Energy (USI PSV3, 2019) | Aligned 6-8; Related 9-12 |
| Matter and Energy (USI PSV3, 2019) | Related 6-12 |
| Hot Soup (USI PSV3, 2019) | Aligned 6-8; Related 9-2 |
| Cold Spoons (USI PSV3, 2019) | Aligned 6-8; Related 9-12 |
| How Can I Keep It Cold? (USI PSV3, 2019) | Related 3-5; Aligned 6-8 |

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| PS3.C Relationship Between Energy and Forces | Rolling to a Stop (USI PSV1, 2010) | Aligned 6-8; Related 9-12 |

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| PS3.D Energy in Chemical Processes and Everyday Life | Is It Food? (USI V4 2009) | Related 3-5 |
| Food for Plants (USI V2 2007) | Related 6-8 |
| Respiration (USI V3, 2008) | Related 6-12 |
| Light and Dark (USI LSV1, 2011) | Related 6-8 |

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| PS4.A Wave Properties | Making Sound (USI V1, 2005, 2019) | Aligned K-2; Related 3-12 |
| Do the Waves Move the Boat? (USI K-2, 2013) | Aligned 3-5 |
| Rubber Band Box (USI K-2, 2013) | Related K-2 |

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| PS4.B Electromagnetic Radiation | Can It Reflect Light? (USI V1, 2005, 2019) | Aligned 3-5; Related 6-8 |
| Apple in the Dark (USI V1, 2005, 2019) | Aligned 3-5; Related 6-8 |
| Birthday Candles (USI V1, 2005, 2019) | Related 3-12 |
| Mirror on the Wall (USI V3 2008) | Related 6-12 |
| Shadow Size (USI K-2, 2013) | Related K-2 |
| Moonlight (USI V4, 2009) | Aligned K-2; Related 3-5 |

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| PS4.C Information Technologies and Instrumentation | No probes available yet. These will be added when USI Phys Sci Vol. 4- Light, Sound, and Waves is published. | N/A |

**Key to USI Book Codes:**

USI V1, 2005: Keeley, P. 2019. *Uncovering Student Ideas in Science- Vol. 1, 2nd Edition- 25 Formative Assessment Probes.* Arlington, VA: NSTA Press. (1st edition- 2005)

USI V2, 2007: Keeley, P., F. Eberle, and J. Tugel. 2007. *Uncovering Student Ideas in Science- Vol. 2- 25 More Formative Assessment Probes.* Arlington, VA: NSTA Press

USI V3, 2008: Keeley, P., F. Eberle, and C. Dorsey. 2008. *Uncovering Student Ideas in Science- Vol. 3- 25 Another Formative Assessment Probes.* Arlington, VA: NSTA Press

USI V4, 2009: Keeley, P., and J. Tugel. 2009. *Uncovering Student Ideas in Science- Vol. 4- 25 New Formative Assessment Probes.* Arlington, VA: NSTA Press

USI PSV1: Keeley, P. and R. Harrington. 2010. *Uncovering Student Ideas in Physical Science, Volume 1- 45 New Force and Motion Assessment Probes.* Arlington, VA: NSTA Press

USI LSV1, 2011: Keeley, P.2011. *Uncovering Student Ideas in Life Science- 25 New Formative Assessment Probes.* Arlington, VA: NSTA Press

USI K-2, 2013: Keeley, P.2013. *Uncovering Student Ideas in Primary Science- 25 New Formative Assessment Probes for K-2.* Arlington, VA: NSTA Press

USI PSV2: Keeley, P. and R. Harrington. 2014. *Uncovering Student Ideas About Physical Science, Volume 2- 39 New Electricity and Magnetism Formative Assessment Probes.* Arlington, VA: NSTA Press

USI PSV3: Keeley, P. and S. Cooper. 2019. *Uncovering Student Ideas About Physical Science, Volume 2- 32 New Matter and Energy Formative Assessment Probes.* Arlington, VA: NSTA Press

**Connections to the Disciplinary Core Ideas (DCIs)- Related or Aligned?**

**Related**- Most formative assessment probes are designed to address related ideas that students need or can use to develop a full understanding of the DCIs. A concept or idea elicited by the probe can be related to a DCI but not an exact match. For example, “Is It Matter?” addresses the concept of matter; a concept necessary to understanding matter-related ideas. “Ice Cubes in a Bag” is related to the grades 3-5 PS1.B DCI because it addresses conservation of matter. However, it is considered related because it uses the concept of, mass, instead of weight. “Lemonade” is aligned to the 3-5 PS1.B DCI because it addresses conservation of matter using weight. It is related to the 6-8 PS1.B DCI because, although it addresses conservation of matter, it uses a physical change rather than a chemical change. Some probes are considered related to a DCI when they address examples or contexts not explicitly included in the DCI. For example, “Solids and Holes” is related to the PS1.A DCI because it addresses a property of matter, even though density is not explicitly addressed in the DCI. “How Far Does It Go?” is related to the PS2.A DCI, because students need to know how to measure intervals to determine distance traveled when observing motion.

**Aligned-** Some formative assessment probes are an exact match to the grade level DCI and can be used for both formative and summative purposes. For example, “What Happens When You Wrap a Magnet with Aluminum Foil?” is considered aligned to the PS2.B DCI as students need to use the idea of a magnetic field to explain the phenomenon.