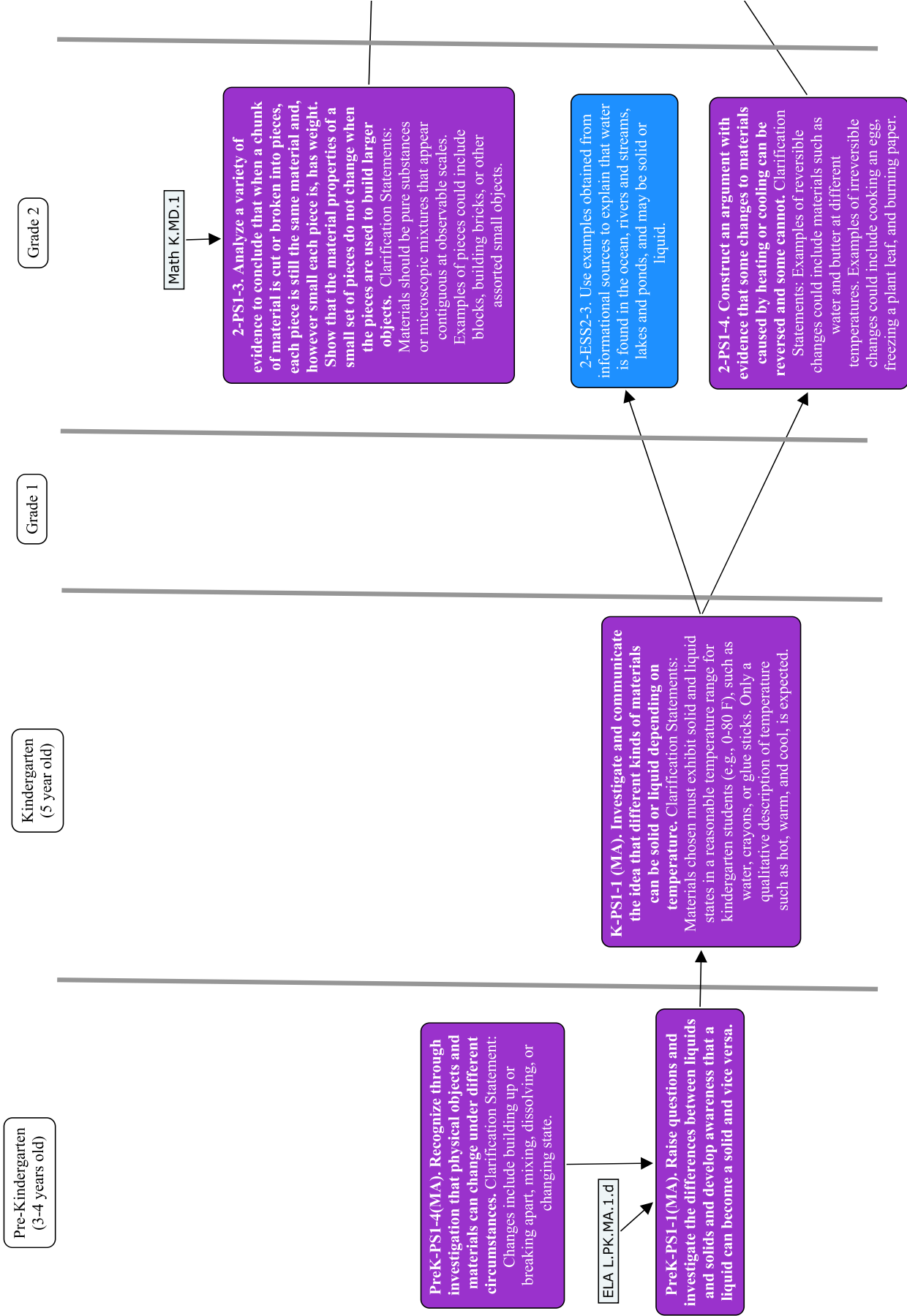
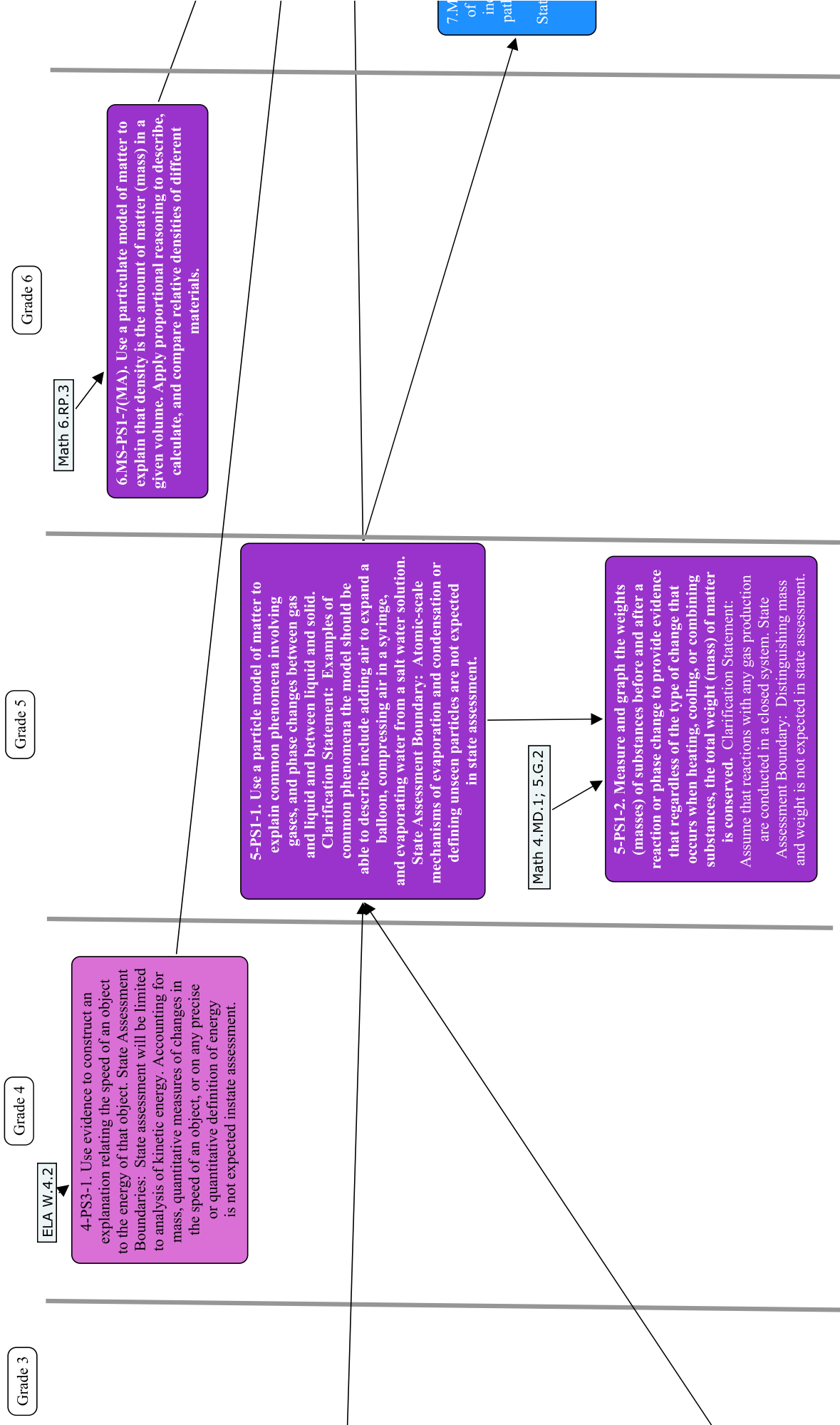


2016 MA STE Topic St



Strand Map: STATES OF MATTER -- PHASE CHANGE (April)

Please direct comments, suggested edits, and questions to: mathsciencetech@doe.mass.edu.
The standards and strand maps are available at: www.doe.mass.edu/sci/review.html
(*) denotes integration of technology/engineering through a practice or core idea.



Grade 7

Grade 8

High School

ELA WHST.6-8.1

ESS2-4. Develop a model to explain how the energy the Sun and Earth's gravity drive the cycling of water, including changes of state, as it moves through multiple ways in Earth's hydrosphere. Clarification Statement: Examples of models can be conceptual or physical. Assessment Boundary: A quantitative understanding of the latent heats of vaporization and fusion is not expected in state assessment.

8.MS-PS1-4. Develop a model that describes and predicts changes in particle motion, relative spatial arrangement, temperature, and state of a pure substance when thermal energy is added or removed. Clarification Statements: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawings and diagrams. Examples of pure substances could include water, carbon dioxide, and helium.

HS-PS1-5. Construct an explanation based on kinetic molecular theory for why varying conditions influences the rate of a chemical reaction or a dissolving process. Design and test ways to slow down or accelerate rates of processes (chemical reactions or dissolving) by altering various conditions.* Clarification Statements: Explanations should be based on three variables in collision theory: (a) quantity of collisions per unit time, (b) molecular orientation on collision, and (c) energy input needed to induce atomic rearrangements. Conditions that affect these three variables include temperature, pressure, concentrations of reactants, agitation, particle size, surface area, and addition of a catalyst. State Assessment Boundary: State Assessment will be limited to simple reactions in which there are only two reactants and to specifying the change in only one variable at a time.

Math 7.EE.4

HS-PS2-8(MA). Use kinetic molecular theory to compare the strengths of electrostatic forces and the prevalence of interactions that occur between molecules in solids, liquids, and gases. Use the combined gas law to determine changes in pressure, volume, and temperature in gases.