ASPECT's Sample Frameworks

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Buoyancy SOLO Taxonomy

Level	Score	General Description	Task/Context Specific Description	Sample Student Responses
Prestructural	1	The task is not attacked appropriately, the student hasn't understood the point, or question is reworded.	No aspect of buoyancy (sinking/floating) has been used in the response. Either the student does not understand the question or the student has answered with ideas/concepts that are ***unrelated/unproductive***.	*Things sink or float because of their air mass and inertia.* *Some things sink because the center mass will get angry if it is too far to the left or right.*
Unistructural	2	One aspect of the task is picked up and used.	A ***single useful aspect*** of sinking/floating is mentioned. Useful concepts include weight/mass, size, shape, material, & force.	*Things float when they have a little weight.* *Things sink because sometimes its to hevey or its gravity that pulls us down.* *I think why things sink is because the bottom of it is not straight.* *I think things sink or float because of shape not weight. That's why boat are not just a block.*
Multi-structural	3	Several (two or more) aspects of the task are learned but are treated separately.	***Two or more useful aspects*** have been mentioned ***but not integrated***. Useful concepts include weight/mass, size, shape, material and/or force.	*If it is big metle it will sink. If it is small metle it will sink…* *Things sink and float because of 3 thing matter, shape, and size without them we couldn't make things float or sink!*

Level	Score	General Description	Task/Context Specific Description	Sample Student Responses
Relational	4	The components are integrated into a coherent whole, with each part contributing to the overall meaning.	***Two or more useful aspects*** are included and together they contribute to an explanation of sinking/floating. The response ***attempts to explain how/why*** weight/mass, size, shape, and/or forces contribute to sinking/floating.	*Things sink/float due to weight, size, and shape. Heavy things can float if you change its shape.* *Objects float & sink because of what its made of and because of the shape of the object. If a brick is in the shape of a block it will sink. If it is in the shape of boat it will float.* *Doesn't matter how big it is. If there is a big block that barely weighs anything and a tiny block that is metal. The big block will float and the tiny one will sink. And when something is heavy and it sinks you can make it into a bowl and it will float.* *Objects float and sink because of what it is made of and because of the shape of the object. Example: if a brick is in a shape of a block it will sink if its in a shape of a boat it will float.* *I think it depends on mass and shape because on game the shapes were different sizes and they still were floating. The material were cork and wood but when the metal was in a bowl shape it floated.* *I think thinks sink and float because of their material, shape, size, and weight, Even though the material is made out of heavy things the shape and size can effect it.*
Extended Abstract	5	The integrated whole at the relational level is reconceptualized at a higher level of abstraction, which enables generalization to a new topic or area, or is turned reflexively on oneself .	Responses reflect applications/extensions beyond the immediate context. These include more abstract concepts such as density, volume, and/or water displacement.	

Matter & Phase Change

Modified Children's Beliefs about Matter Interview: Targeted Domains/Ideas

Script/Questions [ask verbatim]	**Targeted Domain/Idea:**
1. Take a look at this sugar cube. *What do you think it is made of?*	Particulate Nature of Matter (PNM); physical properties of substances
2. *Is it just one big piece of material or is it made of smaller parts/bits?* *How big are they? What shape are they?* *How are these pieces similar to the original sugar cube? How are these pieces different to the original piece of sugar?* *Do you want to draw them?* [encourage them to draw]	PNM
3. Take a look at this water. *What do you think it is made of?*	PNM; physical properties
4. *Is it just one big piece or is it made of smaller parts/ bits?* *How big are they? What shape are they?* *How are these parts/bits similar to the cup of water? How are these parts different?* *Do you want to draw them?* [encourage them to draw]	PNM
5. *Why do you think the sugar hold its shape but the water flows?*	Intermolecular Forces (IMF)
6. *Tell me how ice is made.* [If no answer or wrong answer THEN SAY if you put a tray of water in the freezer for a few days, what will be in the tray?]	Physical changes
7. *What do you think this ice cube is made of? Why do you think the ice cube holds its shape but the water flows?*	PNM; IMF
8. *If you leave this ice cube on the table, it starts to melt. Why does it melt? What do you think might be happening to the parts/bits of water? Do you want to draw them?* [encourage them to draw]	Physical changes; IMF

Adapted from: Nakhleh, M. B. and Samarapungavan, A. (1999). Elementary school children's beliefs about matter. *Journal of Research in Science Teaching,* 36, 777–805.

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Ice Melting Prompt ID: _____

[Level I-Image only] Pre-post move from **macroscopic** view to **microscopic** view: ____ no ____ yes

Notes:

[Level II- Text & Image]

Explanation of Ice Melting	Student ID: PRE	Student ID: POST	Notes/comments
Macroprocess Explanation based on a perception of a macroprocess occurring, such as 'water freezes and turns into ice'; phenomenon-based re-descriptions of the observed phenomenon			
Macroprocess-heat Explanation based on a perception of a macroprocess involving heat, such as 'ice melts when it gets warm'; a mechanism is suggested			
Microprocess Explanation based on a molecular level process, such as 'water molecules move apart'; no mechanism…considers only structural state			
Microprocess-heat Explanation based on a molecular level process involving heat, such as 'atoms spread out when you warm something'; a mechanism is suggested			
Image-Text Relationship Incompatible: contradict each other; inconsistent Compatible: communicate the same idea or concept Complementary: work together to fill out or complete a narrative of the phenomena, mutually supplying each other's lack			

Adapted from: Nakhleh, M. B., & Samarapungavan, A. (1999). Elementary school children's beliefs about matter. *Journal of Research in Science Teaching, 36*(7), 777-805.

Physical Properties ID: _____

[Level I- Image only] Pre-post move from **macroscopic** view to **microscopic** view: ____ no ____ yes

Notes:

[Level II- Text & Image]

Explanation of Physical Properties	Student ID: PRE	Student ID: POST	Notes/comments
Macrointrinsic: Explanation based on a property perceived as inherent to the substance, such as 'rock is stiff,' 'jello is squishy'			
Macrostate: Explanation based on the state of the substance, such as 'because it's a liquid'			
Macrocomposition: Explanation based on the composition of the substance, such as 'rock is made of minerals'			
Macroparticulate: Explanation based on a particulate (nonmolecular) view of matter, such as 'milk has pieces but rock doesn't'			
Microparticulate: Explanation based on a molecular view of matter such as 'made of molecules'			
Microparticulate-mechanism: Explanation based a molecular view that includes attention to the underlying mechanism/reason for the observed properties such as the molecules are closer together in the rock; molecules are stuck/loose			
Image-Text Relationship Incompatible: contradict each other; inconsistent Compatible: communicate the same idea or concept Complementary: work together to fill out or complete a narrative of the phenomena, mutually supplying each other's lack			

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Matter & Phase Change FRAPS® User Actions

Desired Action(s)	Completed (tally)	time spent	Notes/comments
Use spoon to feel the ice [macro ice]			
Use microscope to zoom-in [macro--> micro ice]			
Stir spoon in pot [macro water]			
Microscope to zoom-in [macro-->micro water]			
Spoon thru steam [macro steam]			
Microscope to zoom-in [macro-->micro steam]			
Water			
Use the temp. scale			
Use the microscope [macro <---> micro]			
Use microscope [micro <---> macro]			
Butter			
Interact w/butter [macro]			
Use temp. scale			
Use microscope zoom –in [macro <---> micro]			
Use microscope zoom out [micro <---> macro]			
Global Notes:			Total Time: