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What are the barriers?

What are the needs?

How were barriers reduced/eliminated?

How were needs met/ managed?

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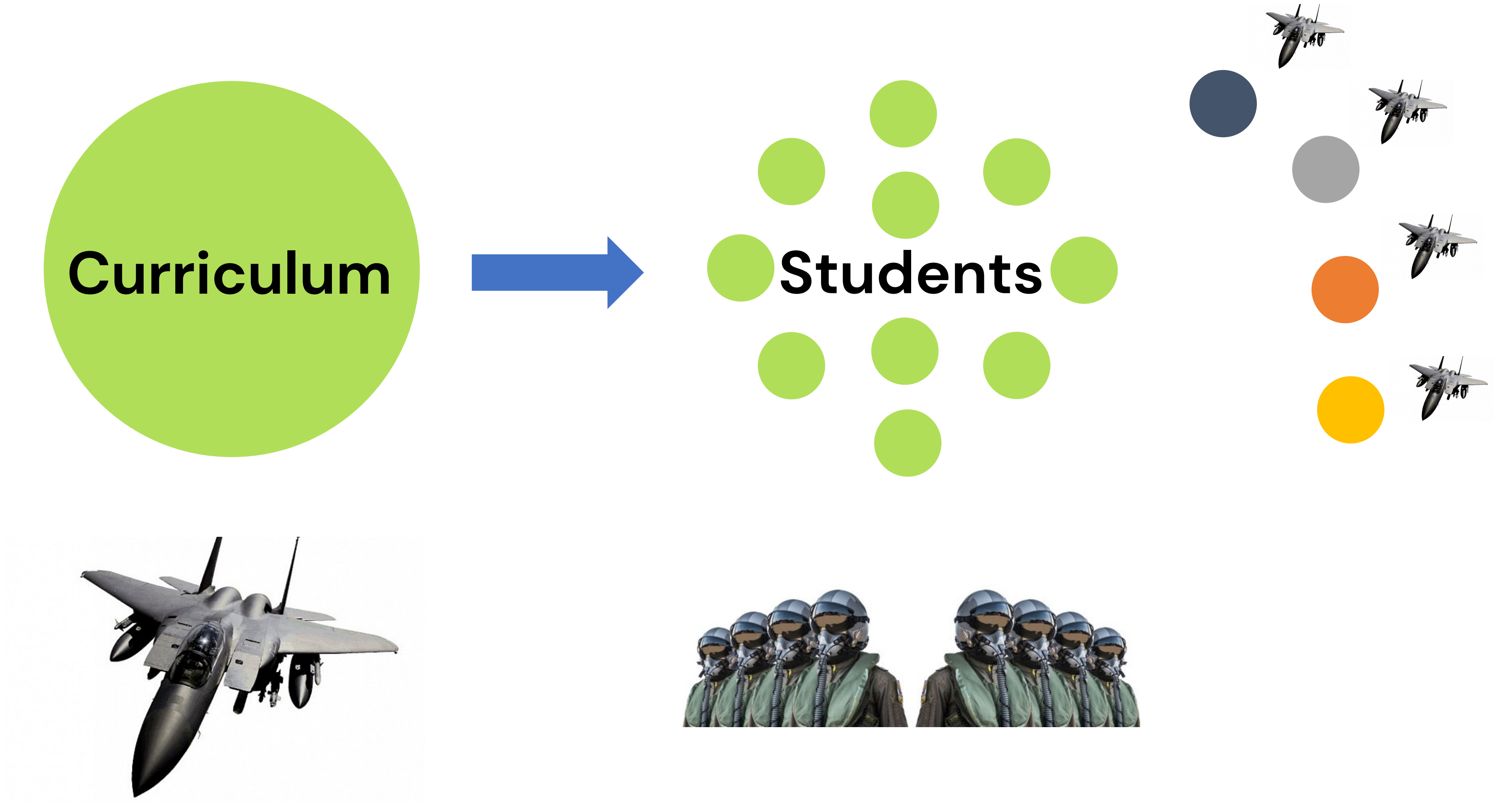
Reducing Barriers to plan for ALL?

The fewer the barriers in a place, the fewer individual supports a person needs.

The less barriers a person in a place, the more independence, safety, belonging and success a person feels

WHAT & HOW WE WERE TAUGHT...



WHAT IF WE ANTICIPATED *variability*

INSTEAD OF *homogeneity?*

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2023

HOW DO WE DESIGN AN ADJUSTABLE PLANE?

- Who are the **pilots**? What are their **dimensions**?
- What kind of **planes** are they flying?
- How is the plane **responsive** to the pilot's dimensions?
- How do the **pilots make the adjustments** they need to fly the plane?

HOW DO WE DESIGN AN ADJUSTABLE PLANE?

- Who are the **students**? What is the range of the **variability**?
- What is the **grade level curriculum** that students need to access?

- How is the grade level curriculum **responsive** to the range of student variability?
- How do we help **students to make the adjustments** they need to access the grade level curriculum?

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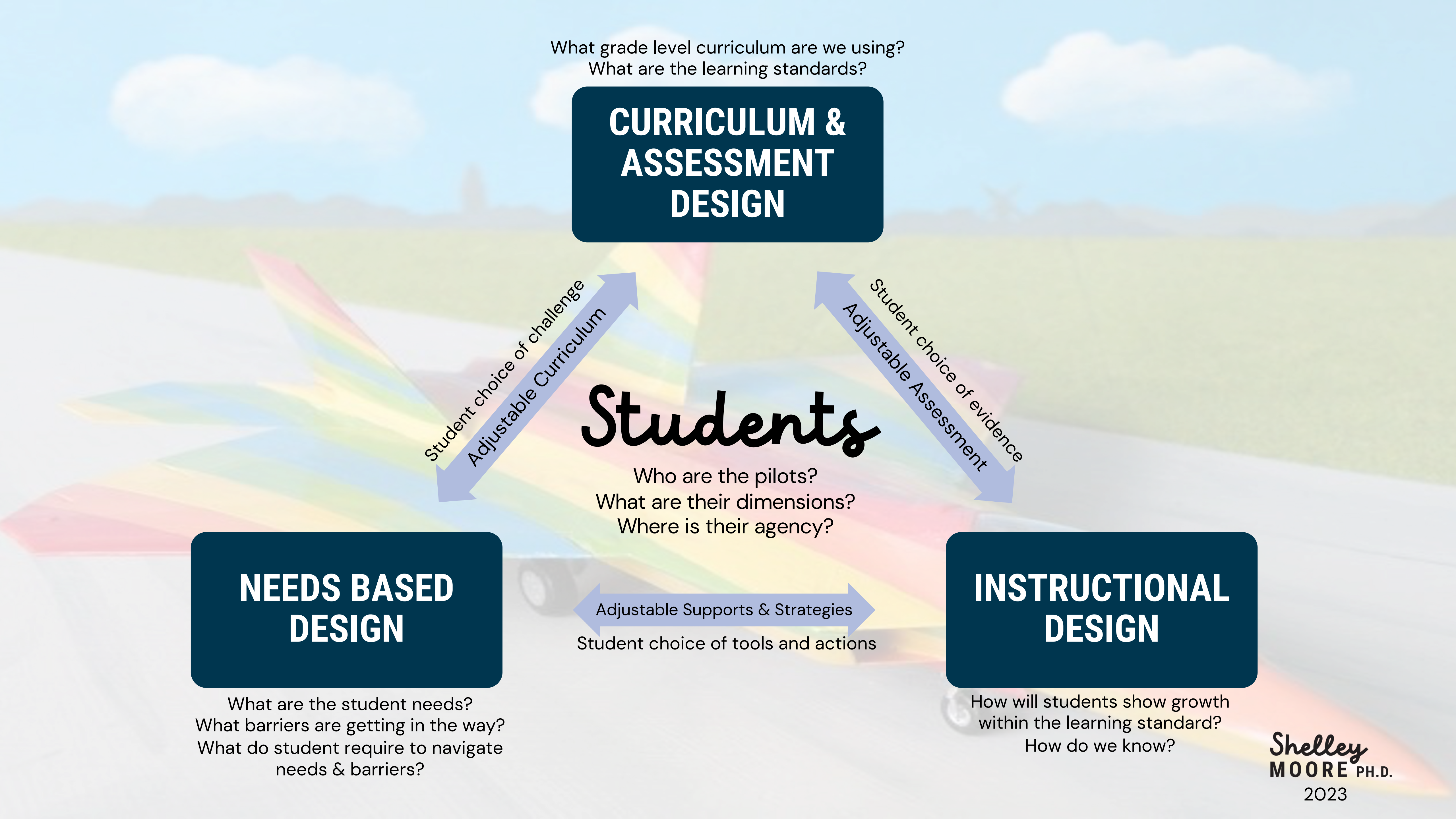
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Students
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What are their dimensions?
Where is their agency?
NEEDS BASED DESIGN
Adjustable Supports & Strategies
Student choice of tools and actions
INSTRUCTIONAL DESIGN
What are the student needs?
What barriers are getting in the way?
What do student require to navigate needs & barriers?
How will students show growth within the learning standard?
How do we know?
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2023

Tumwater School District

Tumwater, WA

Peter G Schmidt Elementary School

Grade 5 - Science

Tumwater School District

Tumwater, Washington

Peter G Schmidt Elementary School - Grade 5 - Science

Coaching Sessions (4 x 90 min sessions)					
	Session 1	**Session 2**	**Session 3**	**Session 4**	**Session 5**
What we did together in 90 min session	Getting to know learners - Class Review - Target Students - Needs Based Reflection	Making decision to support learning - Needs Based Reflection	Designing Inclusive Learning Experiences - Backwards Design - Learning Continuums	Designing Inclusive Learning Experiences - UDL Lesson Design	- Assessing Student Learning - Sharing our learning
What teams did in between sessions	- Gather information from students	- Teach a needs-based strategy lesson	- Gather curricular resources	- Teach a lesson - Gather evidence	- Share the process with others

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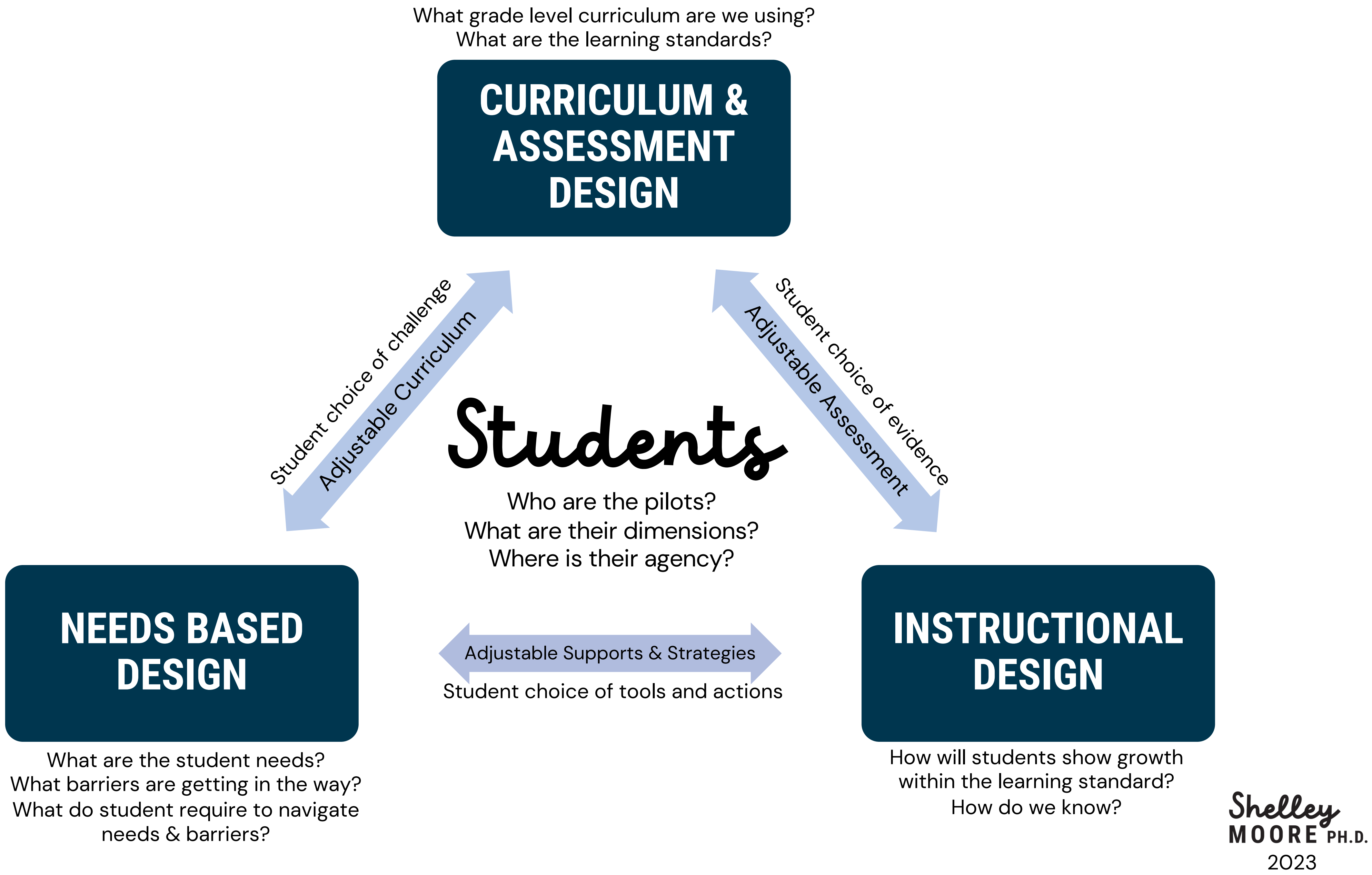
What are the needs?

How were barriers reduced/eliminated

How were needs met/ managed?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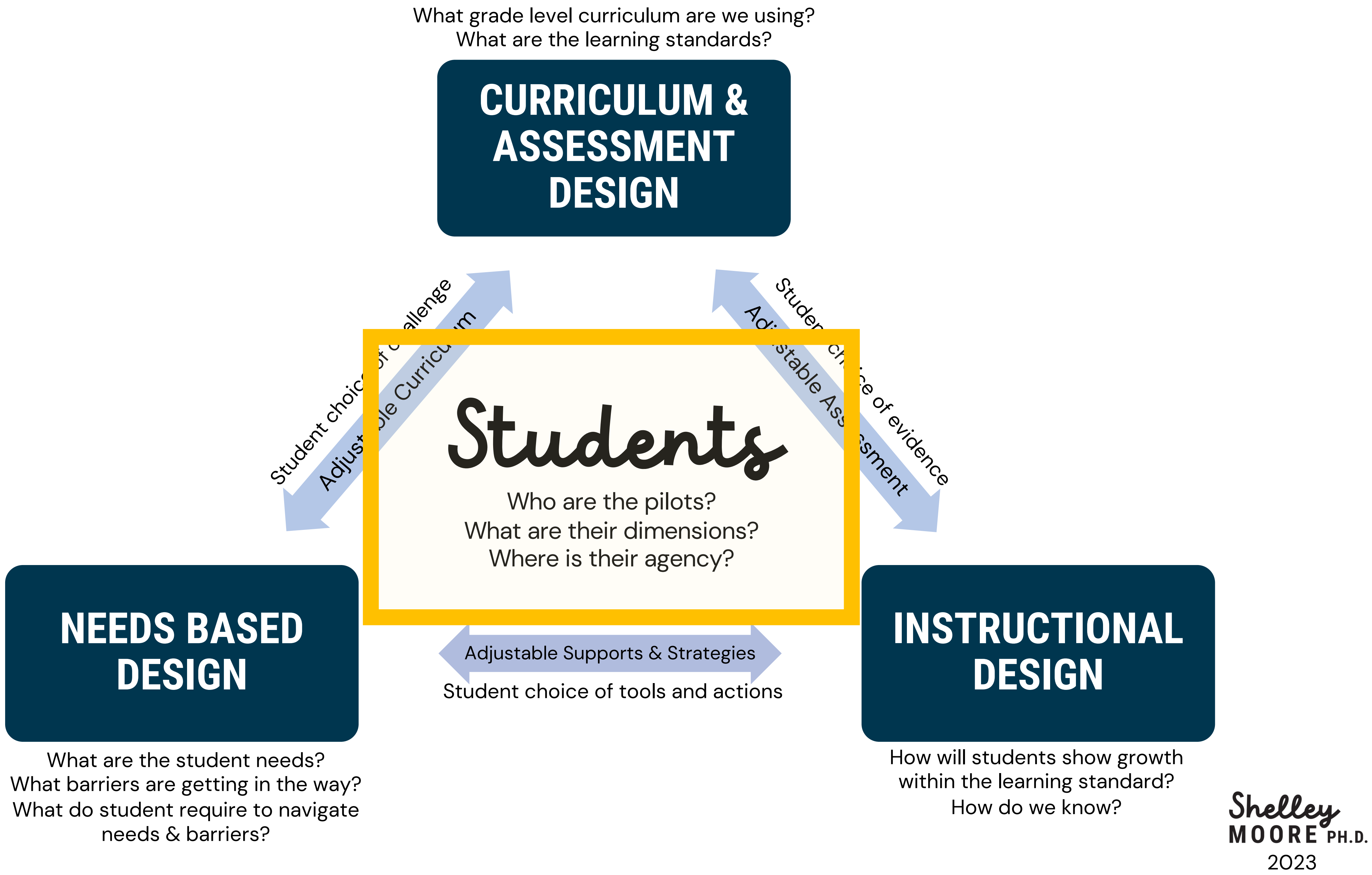
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Getting to know and making decisions to support students

Strategies:

- The Class Review
- Needs Based Reflection
- Needs Based Support Plan

Classroom Support Planning: Collaborative Needs Based Reflection

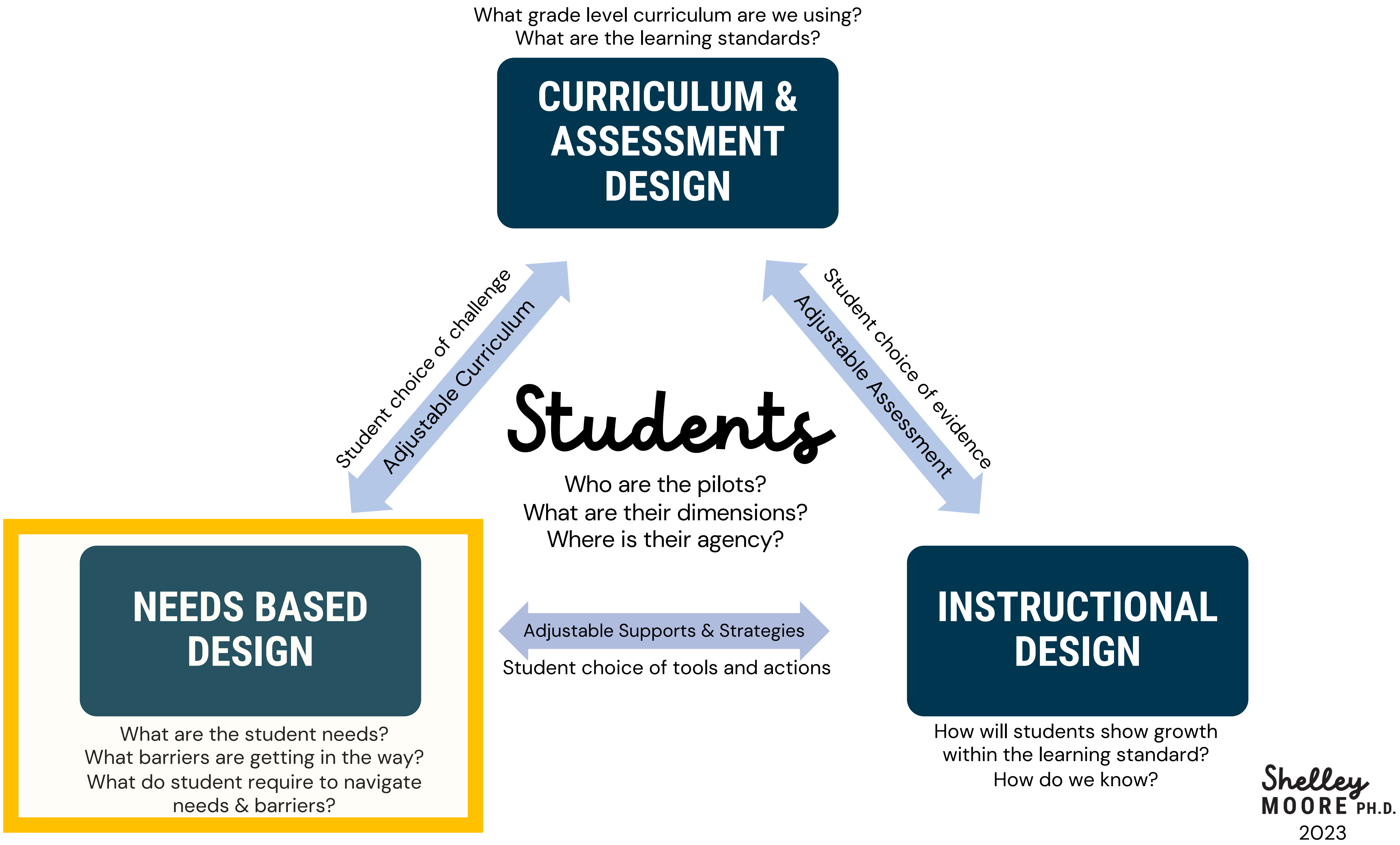
Target Classroom: **Classroom Teacher(s):** **Support Teachers/Staff:** **Date:**

1. Look at the following areas of need as a team
2. Record needs for students who have IEPs (Individual education plan) and/or LSPs (learning support plan)
3. You can refer to individual assessments and recommendations as well as specialists to determine needs if useful
4. Record needs for students in class who do not have IEP or LSP
5. Look for clusters of need and reflect on community impact
6. Determine priority classroom needs to develop Classroom Support Plan

Areas of Need	Students who have this need (underline students who have IEP/504)	This need impacts the community and/or there is a cluster of students who have this need	This need can be managed over time and/or not critical	This is an individual need area and/or community does not need support in this area
Addiction				
Attendance/ Lateness	JA			x
Attention	JA, RM		x	
Anxiety/ Depression	GA, LB, JA, ES, KR, GS	x		
Bullying				
Communication (receptive)				
Communication (expressive)	GA, LB		x	
Eating/Food/Allergies	LB			x
Engagement/Motivation	LB, JA, ES, NS	x		
Executive Functioning	MA, LB, JA	x		
Family/Community/Identity	JA, ES, JK, LE	x		
Frustration/ Anger	JA, ES		x	
Greif/ Trauma	GA, LB, JA, ES, KK	x		
Gross/Fine Motor Skills	LB, BB			x
Intellectual Ability (access)	GA, MA		x	
Intellectual Ability (extend)	BW, IM, MB		x	

Language				
Literacy (decoding)	MA, KR, TP, AD		x	
Literacy (understanding)	GA, MA, KR, TP, AD		x	
Literacy (written output)	MA, LB, KR, TP, AD		x	
Literacy (oral language/speaking)	GA		x	
Medical				
Memory				
Mental Health				
Numeracy	ES, KR			
Personal Care	GA			x
Personal Safety				
Physical/Mobility				
Self-Advocacy	LB			x
Self-Regulation (emotional)	GA, JA, ES	x		
Self-Regulation (behavioural)	ES	x		
Self-Regulation (learning)				
Self Esteem	LB, JA, ES	x		
Self-Harm/ Self Injurious Behaviour				
Sensory				
Social Skills	GA, LB, JA, ES	x		
Transitioning	JA, ES	x		
Other:				
Other:				

Priority Community Needs	**Specialists/Individuals to connect to**	**Priority Individual Needs**	**Specialists/Individuals to connect to**
Anxiety/ emotional self- Regulation	**Counsellors - Jessica**		
Family support/ trauma	**Counsellors – Jessica, Community Schools - Diana**		
Literacy	**Title – Kori, Mica, Melissa**		
Engagement/ Motivation	**Sarah, Shelley, Jasmine, Kim**		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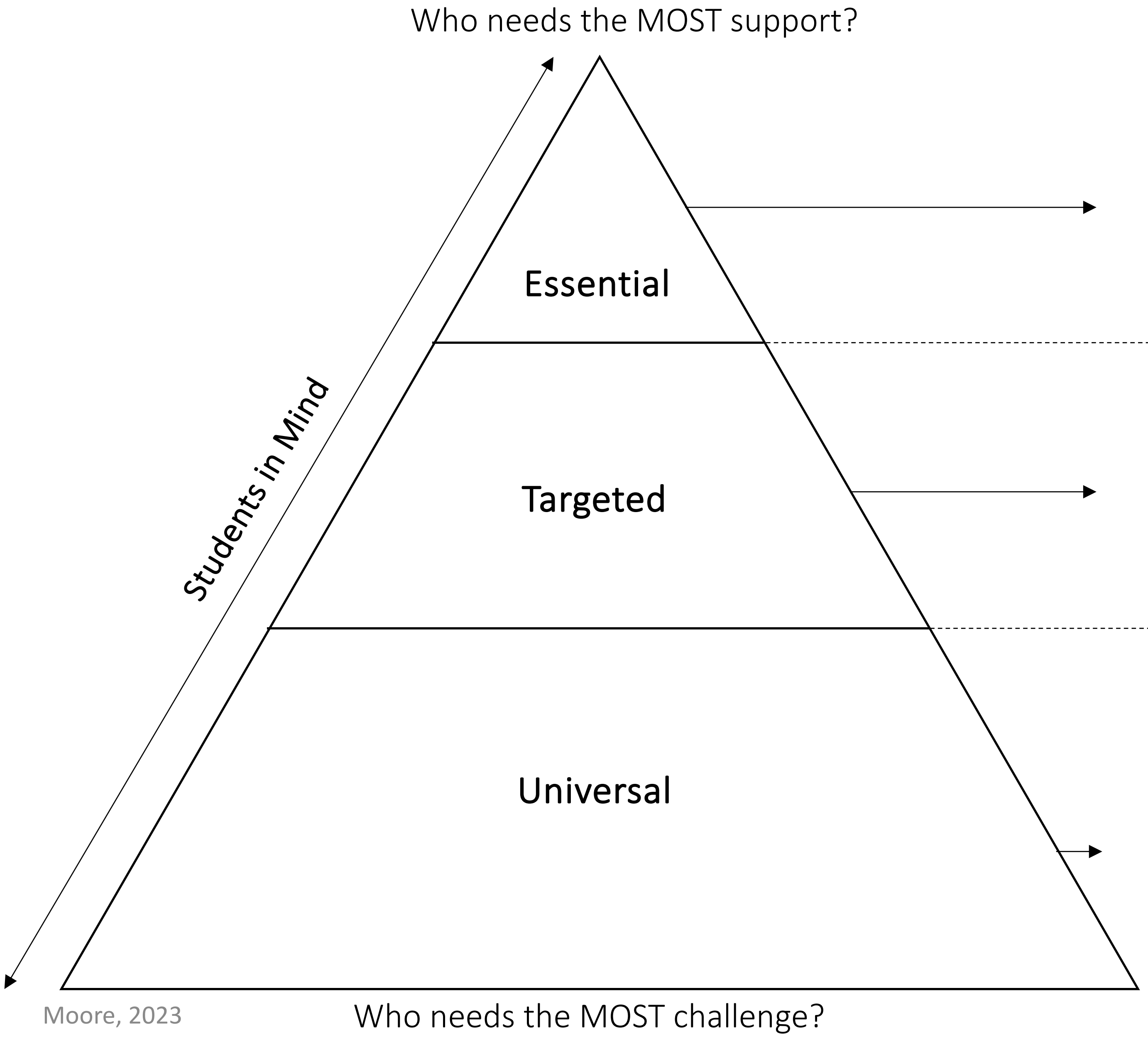
Need: anxiety/emotional self regulation

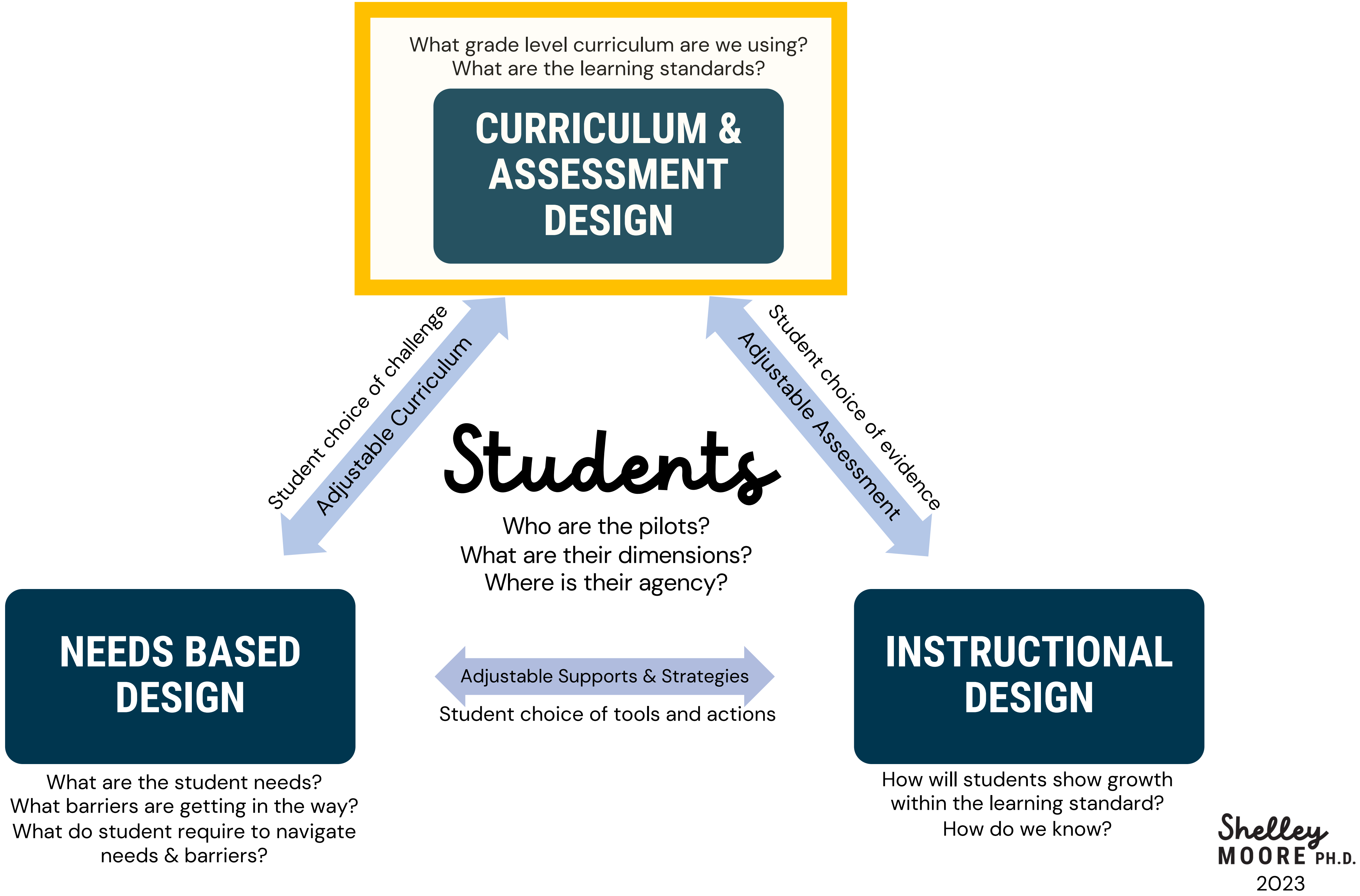
Students in Mind: GA, LB, JA, ES, KR, GS



What supports & strategies are useful for ONE? (Individualized)
- Communication with school team (set up other places to go if needed)
- Individual debriefing
- Check in/ check out system (with resource)
- Built in time at The Nest in schedule
- G: Level of problem (1-5 and how to respond, reinforcement system)

What supports & strategies are useful for SOME? (Choice for ALL
- Calming kit
- Take a break (check in)
- Sensory tools (e.g. fidgets, items from home)
- Choice to go The Nest

What supports & strategies are useful for MOST/ALL?
- Morning meeting, classroom conversations
- Mindful minutes – teaching a strategy
- Routines & structures
- Technology – all practice a strategy (e.g. 5 finger breathing)
- Lessons with counsellor (tools in toolbox)
- Classroom conversations (power of yet, Factor of fear)
- Trust when they need something
- Open communication with families (e.g. Dojo)
- Access to The Nest (SEL space)



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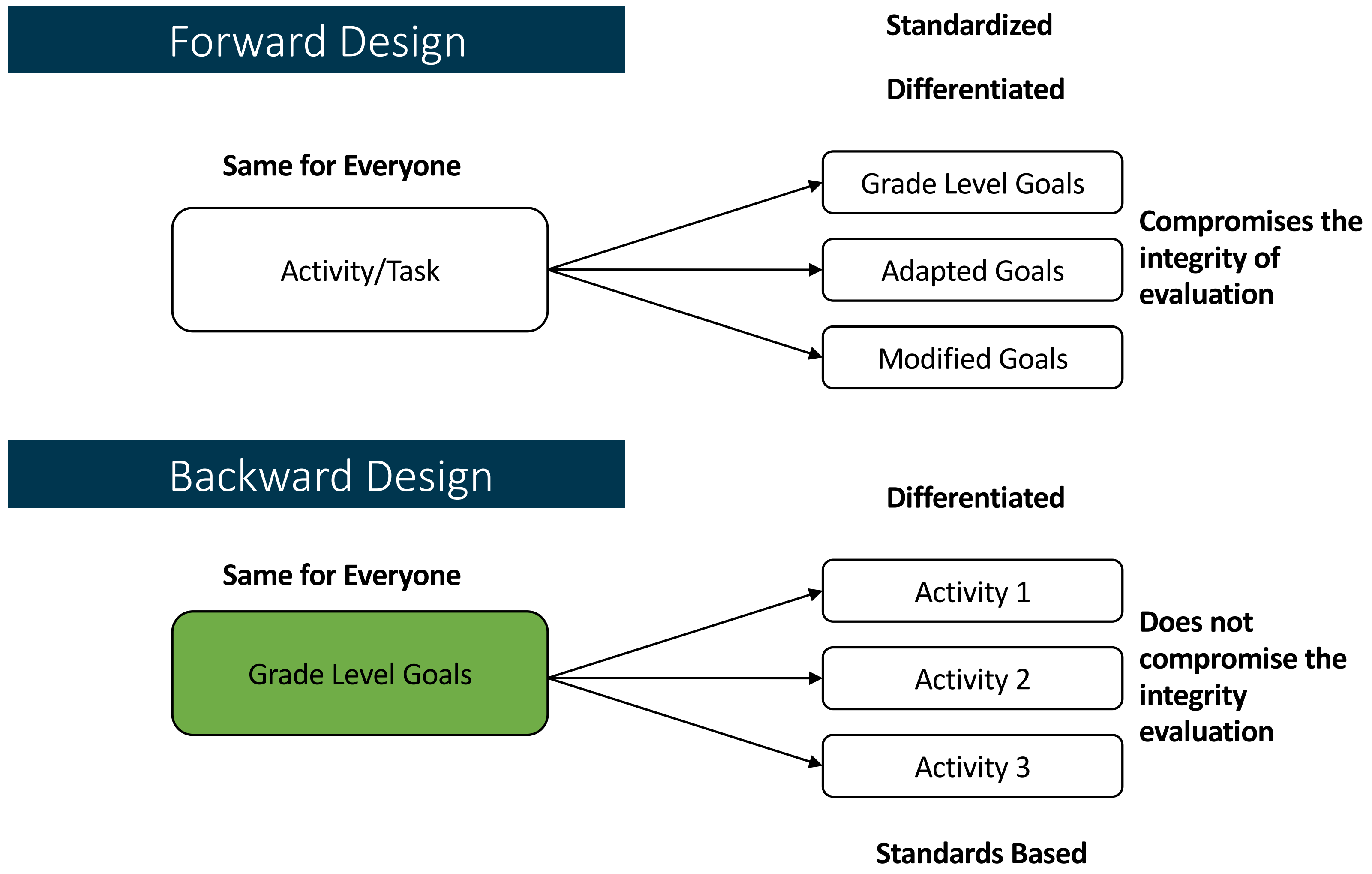
UBD: Determining the Learning Standard



McTigue, 2010

Backwards Design

What do we need to UNDERSTAND?

What do we need to KNOW?

What do we need to DO?

Backwards Design

What do we need to UNDERSTAND?

Big Ideas

What do we need to KNOW?

Knowledge

What do we need to DO?

Skills

N.G.S.S.

What do we need to UNDERSTAND?

Big Ideas

What do we need to KNOW?

Knowledge

What do we need to DO?

Skills

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MS. Structure and Properties of Matter

Students who demonstrate understanding can:

MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures. [Clarification Statement: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of particulate-level models could include drawings, 3D ball and stick structures, or computer representations showing different substances with different types of atoms.] [Assessment Boundary: Assessment does not include valence electrons and bonding energy, discussing the individual ions composing complex structures, or a complete depiction of all individual atoms in a complex molecule or extended structure.]

MS-PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. [Clarification Statement: Emphasis is on natural resources that undergo a chemical process to form the synthetic material. Examples of new materials could include new medicine, foods, and alternative fuels.] [Assessment Boundary: Assessment is limited to the qualitative interpretation of evidence provided.]

MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and phase (state) of a substance when thermal energy is added or removed. [Clarification Statement: Emphasis is on qualitative particulate-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 phase occurs. Examples of models could include drawings and diagrams. Examples of particles could include ions, molecules, or atoms. Examples of substances could include sodium chloride, water, carbon dioxide, and helium.]

MS-PS1-7. Use evidence to illustrate that density is a property that can be used to identify samples of matter. [Clarification Statement: Emphasis should be on students measuring the masses and volumes of regular and irregular shaped objects, calculating their densities, and identifying the samples of matter.]

MS-PS1-8. Plan and conduct an investigation to demonstrate that mixtures are combinations of substances. [Clarification Statement: Emphasis should be on analyzing the physical changes that occur as mixtures are formed and/or separated. Examples of common mixtures could include salt water, oil and vinegar, and air.] [Assessment boundary: Assessment is limited to separation by evaporation, filtration and magnetism.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models
Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems.
- Develop a model to predict and/or describe phenomena. (MS-PS1-1),(MS-PS1-4)

Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions.
- Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. (MS-PS1-8)
- Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions. (MS-PS1-8)

Engaging in Argument from Evidence
Engaging in argument from evidence in 6–8 builds from K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world.
- Construct and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-PS1-7)

Obtaining, Evaluating, and Communicating Information
Obtaining, evaluating, and communicating information in 6–8 builds on K–5 and progresses to evaluating the merit and validity of ideas and methods.
- Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-PS1-3)

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter
- (NYSED) Substances are made of one type of atom or combinations of different types of atoms. Individual atoms are particles and can combine to form larger particles that range in size from two to thousands of atoms. (MS-PS1-1)
- (NYSED) Each substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS1-3),(MS-PS1-7) (Note: This Disciplinary Core Idea is also addressed by MS-PS1-2.)
- (NYSED) In a solid, the particles are closely spaced and vibrate in position but do not change their relative locations. In a liquid, the particles are closely spaced but are able to change their relative locations. In a gas, the particles are widely spaced except when they happen to collide and constantly change their relative locations. (MS-PS1-4)
- Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (MS-PS1-1)
- (NYSED) The changes of state that occur with variations in temperature and/or pressure can be described and predicted using these models of matter. (MS-PS1-4)
- (NYSED) Mixtures are physical combinations of one or more samples of matter and can be separated by physical means. (MS-PS1-8)

PS1.B: Chemical Reactions
- (NYSED) Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different particles, and these new substances have different properties from those of the reactants. (MS-PS1-3) (Note: This Disciplinary Core Idea is also addressed by MS-PS1-2 and MS-PS1-5.)

PS3.A: Definitions of Energy
- (NYSED) The term "heat" as used in everyday language refers both to thermal energy (the motion of particles within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. (secondary to MS-PS1-4)
- (NYSED) Temperature is not a form of energy. Temperature is a measurement of the average kinetic energy of the particles in a sample of matter. (secondary to MS-PS1-4)

Crosscutting Concepts

Patterns
- Macroscopic patterns are related to the nature of microscopic and atomic-level structure. (MS-PS1-1),(MS-PS1-7),(MS-PS1-8)
- Graphs, charts, and images can be used to identify patterns in data. (MS-PS1-1),(MS- PS1-4)

Cause and Effect
- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS1-4)

Scale, Proportion, and Quantity
- Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-PS1-1)

Structure and Function
- Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS1-3)

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology
- Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-PS1-3)

Influence of Science, Engineering and Technology on Society and the Natural World
- The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-PS1-3)

Connections to other DCIs in this grade-band: **MS.LS2.A** (MS-PS1-3); **MS.LS4.D** (MS-PS1-3); **MS.ESS2.C** (MS-PS1-1),(MS-PS1-4); **MS.ESS3.A** (MS-PS1-3); **MS.ESS3.C**

Articulation of DCIs across grade-bands: **5.PS1.A** (MS-PS1-1); **HS.PS1.A** (MS-PS1-1),(MS-PS1-3),(MS-PS1-4); **HS.PS1.B** (MS-PS1-4); **HS.PS3.A** (MS-PS1-4); **HS.LS2.A** (MS-PS1-3); **HS.LS4.D** (MS-PS1-3); **HS.ESS1.A** (MS-PS1-1); **HS.ESS3.A** (MS-PS1-3)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea. The text in the "Disciplinary Core Ideas" section is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas unless it is preceded by (NYSED).

Backwards Design Planning

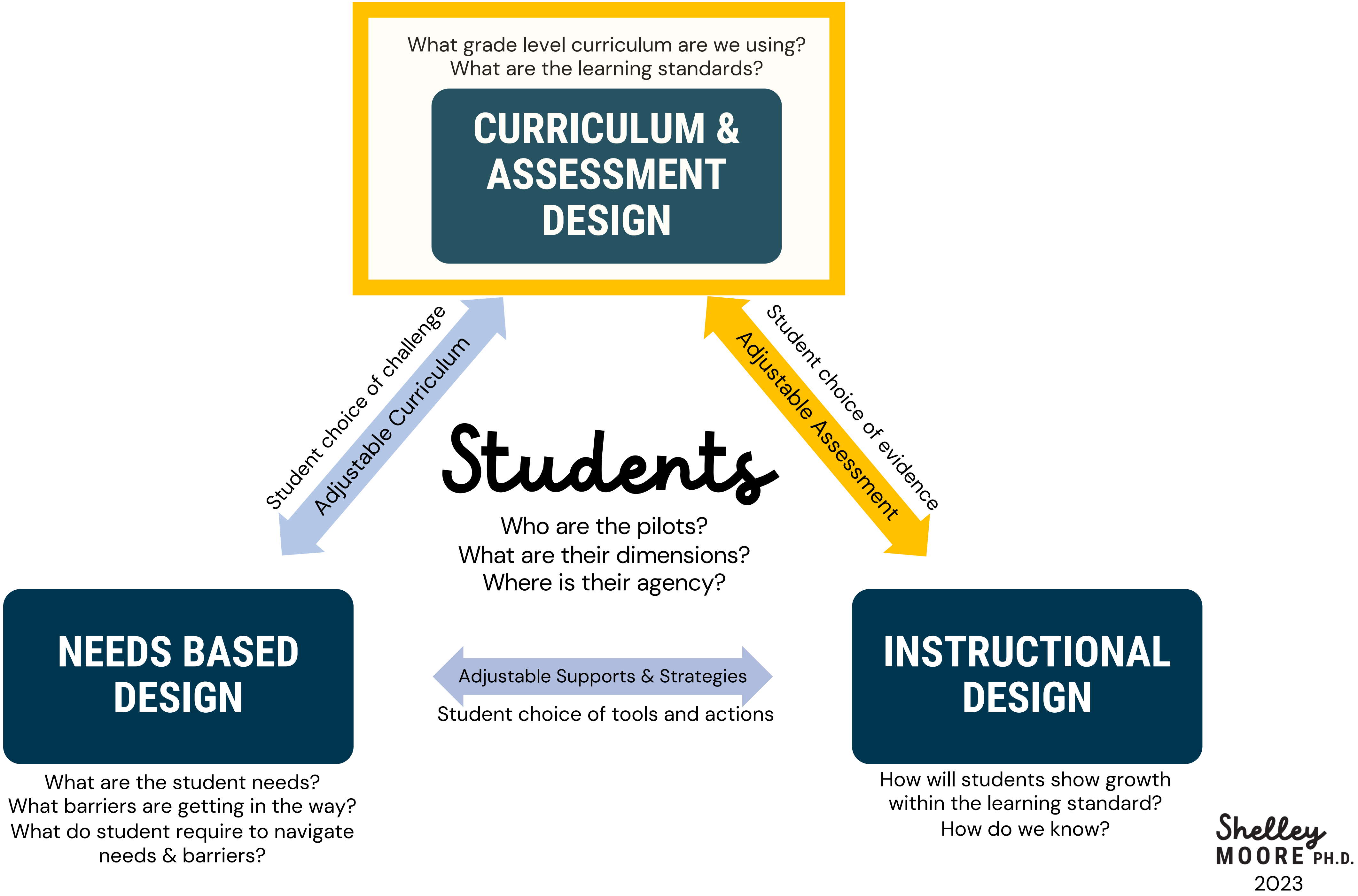
Grade:	Subject Area: Science	Strand/Topic:
Learning Standard:		Unit Guiding Question(s):
Key Vocabulary:		

Learning Goals	Curricular Language What do Students need to Know and Do?	Student Friendly Language
Science and Engineering Practices		
Disciplinary Core Ideas		
Crosscutting Concepts		

Backwards Design Planning

Grade: 5	Subject Area: Science	Strand/Topic: Structure and Properties of Matter
Learning Standard: 5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen		**Unit Guiding Question(s):** How can I use a model to help me understand that some matter is made up of particles that are too small to see?
Content Vocabulary: model, matter, particles, idea, bulk matter		**Skills Vocabulary: create, build, change, solve a problem, observe**

Learning Goals	Curricular Language What do Students need to Know and Do?	Student Friendly Language
Science and Engineering Practices (skills)	**Developing and Using Models** building and revising simple models and using models to represent events and design solutions. Use models to describe phenomena.	• I can create and improve a model • I can use a model to show an idea • I can use a model to solve a problem
Disciplinary Core Ideas (knowledge)	**PS1.A: Structure and Properties of Matter** Matter of any type can be subdivided into particles that are too small to see matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations including the inflation and shape of a balloon and the effects of air on larger particles or objects.	• I know that matter can be broken apart into tiny particles that are too small to see • I know that even if tiny particles are too small for my eyes to see, there are other ways to observe them • I know that a model is a way to observe tiny particles too small to see • I know some examples of models that can help me observe tiny particles that are too small to see
Crosscutting Concepts (understanding)	**Scale, Proportion, and Quantity** Natural objects exist from the very small to the immensely large.	I understand that there are things that are very tiny and very large



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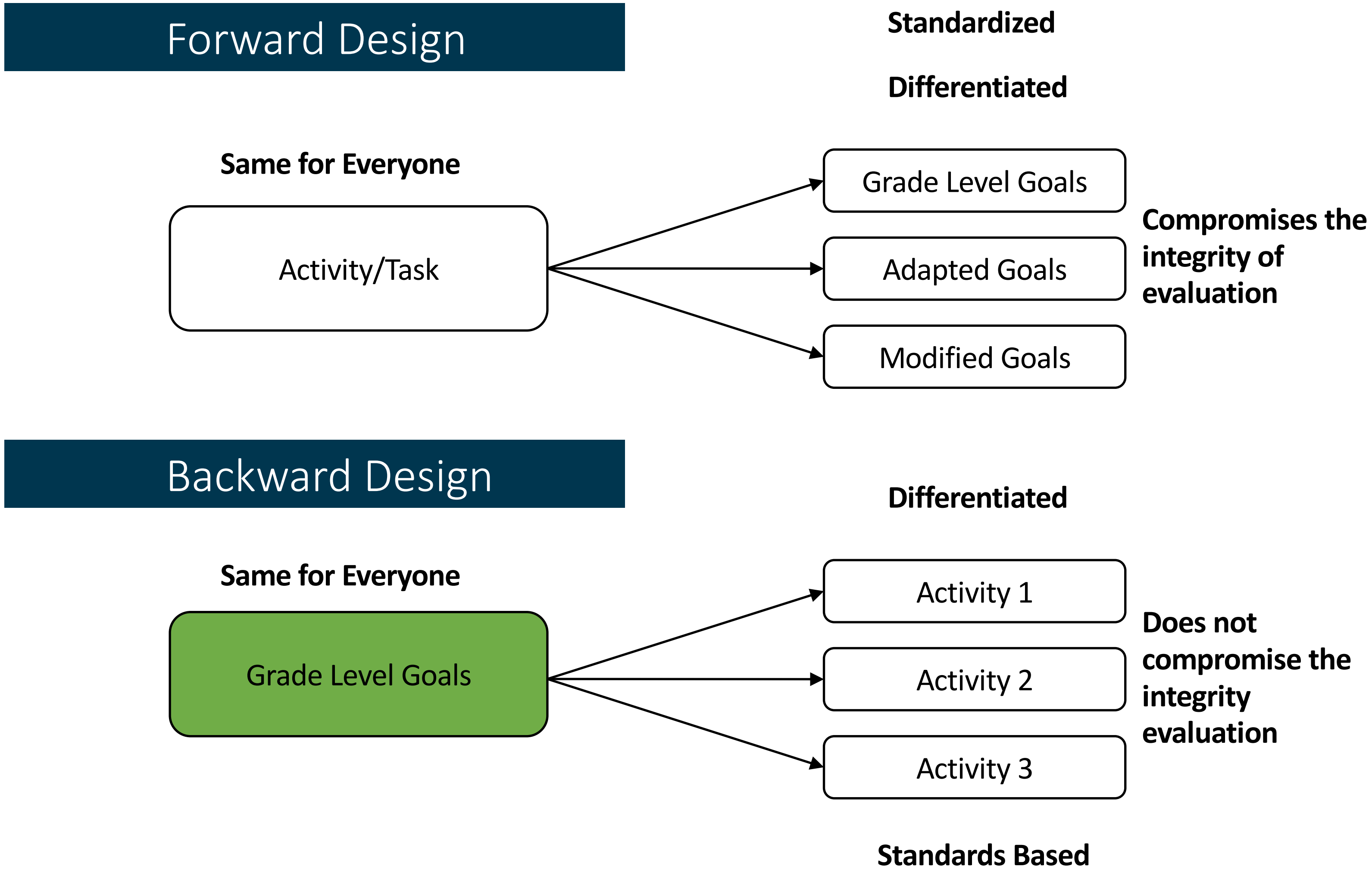

McTigue, 2010

Backwards Design Planning

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Learning Standard: 5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen		**Unit Guiding Question(s):** How can I use a model to help me understand that some matter is made up of particles that are too small to see?
Content Vocabulary: model, matter, particles, idea, bulk matter		**Skills Vocabulary: create, build, change, solve a problem, observe**
Learning Goals	**Curricular Language** **What do Students need to Know and Do?**	**Student Friendly Language**
Science and Engineering Practices (skills)	**Developing and Using Models** building and revising simple models and using models to represent events and design solutions. Use models to describe phenomena.	• I can create and improve a model • I can use a model to show an idea • I can use a model to solve a problem
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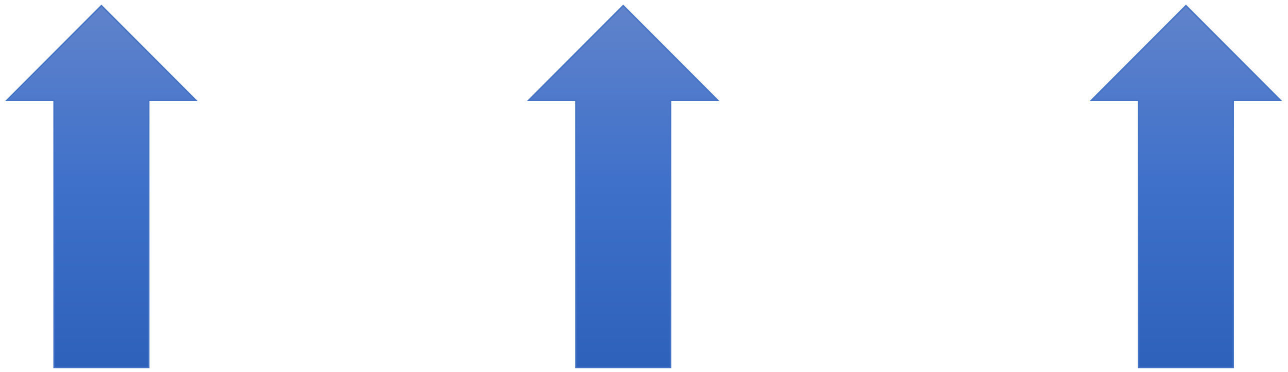
Additive and Asset-Based Learning Continuums

- Differentiated curriculum
- Shifts from “benchmark” to “window” of proficiency
- Same entry point for all/ Multiple exit points
- Start from access, add on challenge
- Different from a rubric

Rubrics vs. Learning Continuum

	deficit	deficit	Most complex description
Grade Level Learning Standard			



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THE SCRUMPTIOUS RUBRIC REFERENCE

BARELY HANGING ON

The customer wants a refund. Bread alone is not a sandwich. It's like you gave the bread and pop out just to show you were listening.

Translation: You only did the small stuff to suffice turning it in. The artwork is missing all important details and signs of understanding or perseverance.

NEEDS SOME UMPH

Your sandwich disappoints the customer. There's no flavor and not enough meat, if any at all. About the only thing great is the Citrus Drop.

Translation: You are missing important details within your artwork. Expectations are not met. Improvement is needed and lack of understanding is present.

GETS THE POINT

Your sandwich met expectations. It has flavor but nothing too exciting. You included the meat but gee, a side of chips would be nice.

Translation: Your artwork meets expectations, you went as far as the requirements expected and you used what knowledge you had to do so.

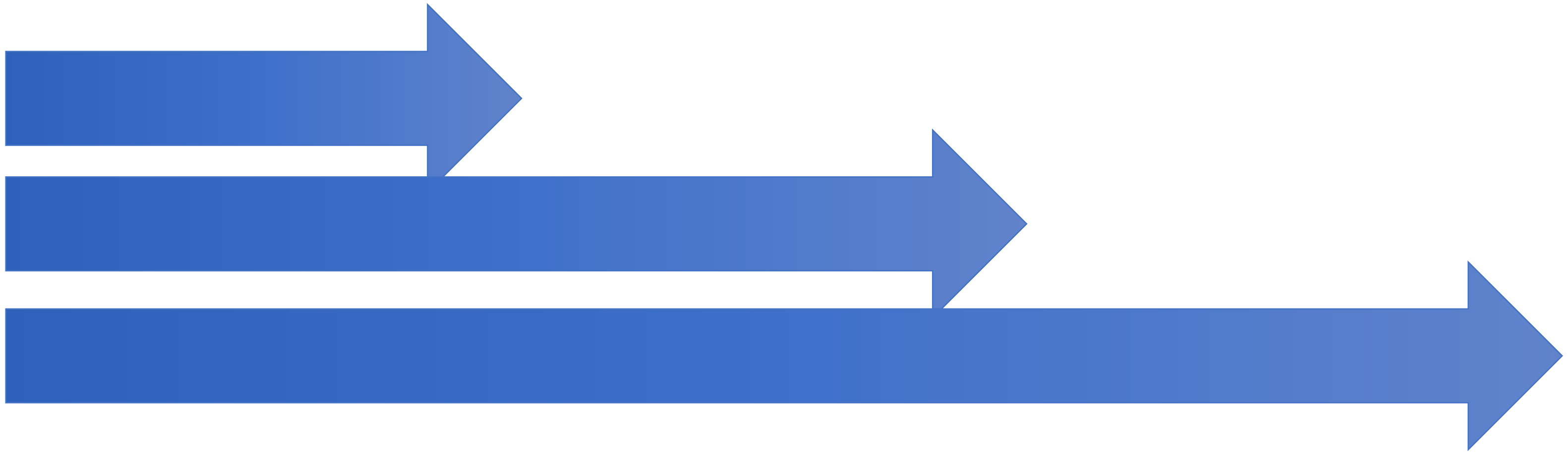
RIGHT ON!

Your sandwich went beyond expectations. You threw in some extra flavor and tomatoes and surprised the customer with a side of chips.

Translation: Your artwork exceeds all expectations; you used creativity, went beyond the basic requirements and showed obvious understanding.

Rubrics vs. Learning Continuum

	Essential	More complex	More complex
Grade Level Learning Standard			



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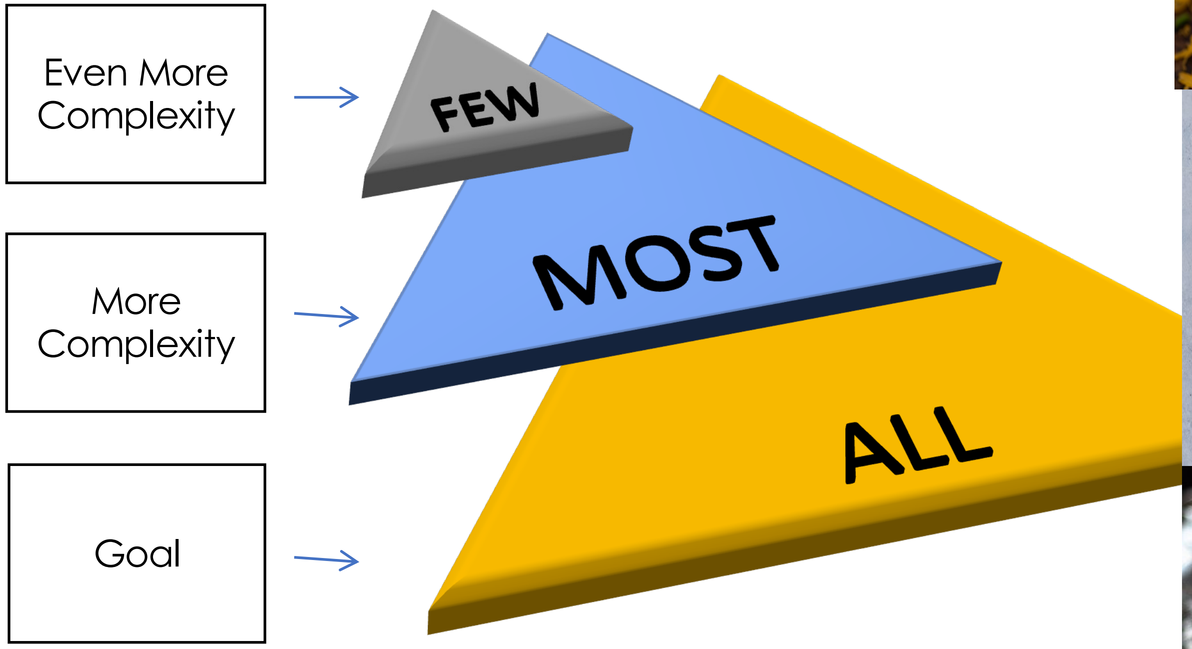
Planning Pyramid



Our Co-Planning Journey: Learning Continuums

1. Using the elaborations for each learning outcome, we constructed a grade-level scaffold in *student friendly language*

Learning Outcome:				
Student friendly:				
		Grade Level		
Approaching	**Emerging**	**Developing**	**Confident**	**Extending**

2. We started with the most essential concept of the outcome and then we added on complexity

3. We extended the grade level scaffold to include an access point and challenge point

Learning Continuums

1. Choose a Learning Standard and translate it into student friendly language

Learning Outcome:			
Student friendly:			
Approaching	**Essential**	**Confident**	**Extending**

2. Start with determining the most essential concept of the standard and then add on complexity

3. Extend the grade level standard to include an access point and challenge point

S, Moore, 2024

1. Choose a Learning Standard and translate it into student friendly language

Grade: 5	Subject Area: Science	Strand/Topic: Structure and Properties of Matter
Learning Standard: 5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen		**Unit Guiding Question(s):** How do we know that something exiits if we cannot see it?
Content Vocabulary: model, matter, particles, idea, bulk matter		**Skills Vocabulary: create, build, change, solve a problem, observe**
Learning Goals	**Curricular Language What do Students need to Know and Do?**	**Student Friendly Language**
Science and Engineering Practices (skills)	**Developing and Using Models** building and revising simple models and using models to represent events and design solutions. Use models to describe phenomena.	• I can create and improve a model • I can use a model to show an idea • I can use a model to solve a problem
Disciplinary Core Ideas (knowledge)	**PS1.A: Structure and Properties of Matter** Matter of any type can be subdivided into particles that are too small to see matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations including the inflation and shape of a balloon and the effects of air on larger particles or objects.	• I know that matter can be broken apart into tiny particles that are too small to see • I know that even if tiny particles are too small for my eyes to see, there are other ways to observe them • I know that a model is a way to observe tiny particles too small to see • I know some examples of models that can help me observe tiny particles that are too small to see
Crosscutting Concepts (understanding)	**Scale, Proportion, and Quantity** Natural objects exist from the very small to the immensely large.	• I understand that there are things that are very tiny and very large

1. Choose a Learning Standard and translate it into student friendly language

Name:	Date:
Performance Expectation: 5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen	
Unit Guiding Questions: How do we know that something exists if we cannot see it?	
Important words to know and use: model, matter, particles, idea, bulk matter, create, build, change, solve a problem, observe	

Learning Goals	Evidence of Learning
• I can create and improve a model • I can use a model to show an idea • I can use a model to solve a problem	
• I know that matter can be broken apart into tiny particles that are too small to see • I know that even if tiny particles are too small for my eyes to see, there are other ways to observe them • I know that a model is a way to observe tiny particles too small to see • I know some examples of models that can help me observe tiny particles that are too small to see	
• I understand that there are things that are very tiny and very large	

Next Generation Science Standards (NGSS)
One Point Rubric with Evidence
S ,Moore, 2024

2. Start with determining the most essential concept of the standard and then add on complexity

Next Generation Science Standards (NGSS)		
Subject Area: Science	**Strand: Matter and Its Interactions**	**Grade: 5**

Performance Expectation: 5-PS1-1 **Students can develop a model to describe that matter is made of particles too small to be seen**	**Guiding Unit Question:** How do we know that something exists if we cannot see it?
Unit Vocabulary (Content): properties, structures, scale, proportion, quantity, models, particles, bulk matter,	**Unit Vocabulary (Skills):** make, observe

Foundations	Student Friendly Language	Access Point	Essential	Confident	Extend
Science & Engineering Practices	I can make a model to help me understand an idea by:	following/ participating in creating a model	planning and creating a model	creating a model to solve a problem	Adjusting or revising a model I have created
Disciplinary Core Ideas	I know that matter is made up of particles that are too small to see by: I know that models can help us see particles that are too small to see by:	describing what matter is describing that there are different states of matter describing examples of different kinds of matter in the world	describing what bulk matter is describing that matter (that I can see) is made up of tiny particles (that are too small to see) describing examples of models that help to observe particles that are too small to see	describing how collecting many tiny particles can help us observe how matter takes up space describing which part of the model is bulk matter, and which part of the model is particles	describing the relationship between matter and particles using the model to describe the relationship between matter and how particles move when they are collected
Crosscutting Concepts	I know that objects in the world can be very large and very small by:	describing objects in the world that are very small and very large	describing what microscopic and macroscopic is and examples of each in the world	describing what is similar and what is different between microscopic and macroscopic objects in the world	describing what scale is and how it helps us understand microscopic and macroscopic objects

***Description: can include but are not limited to written, oral, pictorial, and kinesthetic**

3. Extend the grade level standard to include an access point and challenge point

Next Generation Science Standards (NGSS)		
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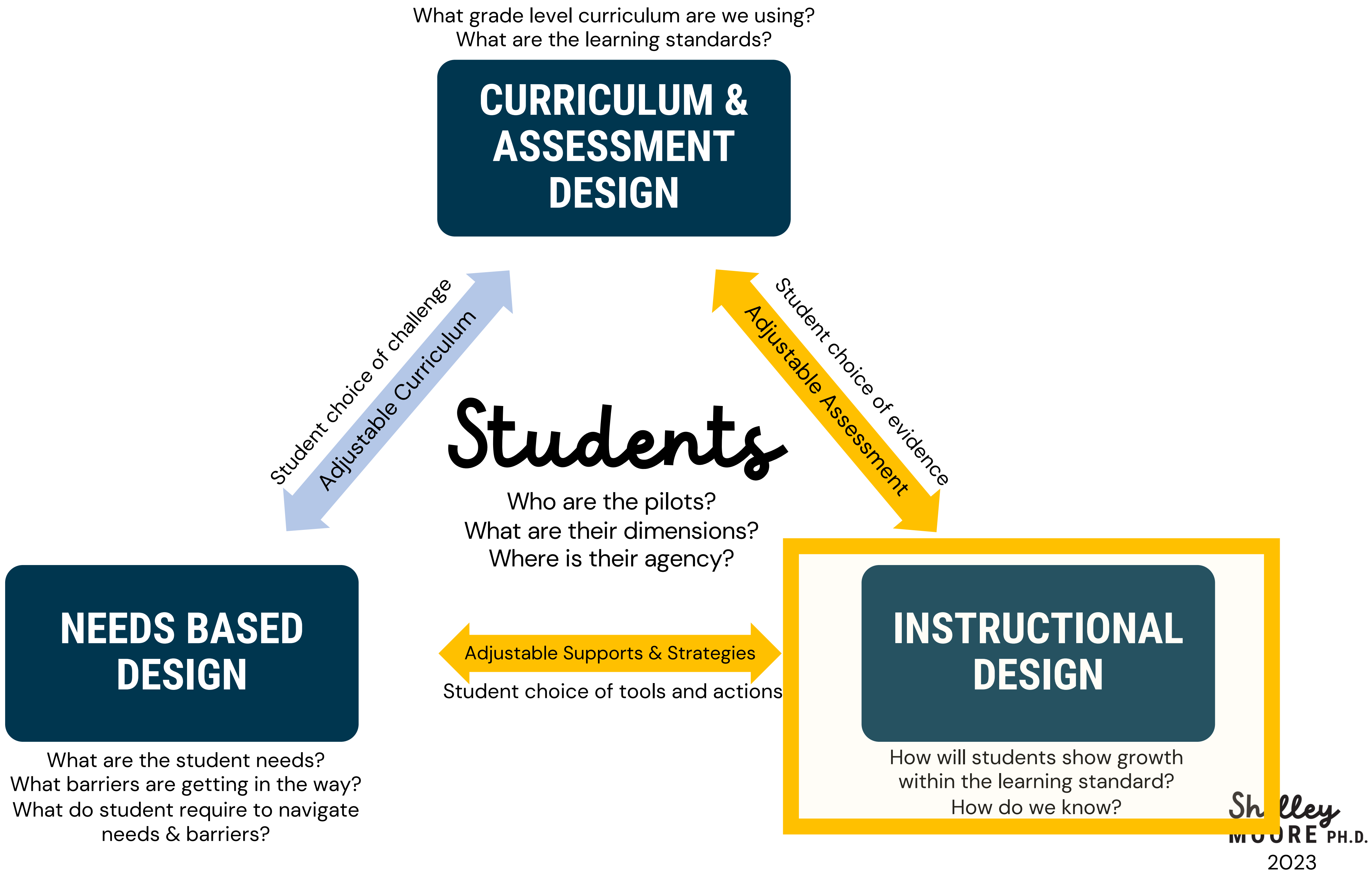


What grade level curriculum are we using?
What are the learning standards?
CURRICULUM & ASSESSMENT DESIGN
Student choice of challenge
Adjustable Curriculum
Student choice of evidence
Adjustable Assessment
Students
Who are the pilots?
What are their dimensions?
Where is their agency?
NEEDS BASED DESIGN
Adjustable Supports & Strategies
Student choice of tools and actions
INSTRUCTIONAL DESIGN
What are the student needs?
What barriers are getting in the way?
What do student require to navigate needs & barriers?
How will students show growth within the learning standard?
How do we know?
Shelley MOORE PH.D.
2023

Lesson in instructional resource

MATERIALS

Student

- 1 Science notebook*
- 1 Student Investigation Sheet 2A: *What Are the States of Matter?*
- 1 Pair of safety goggles*

Team of four students

- 1 Clear plastic container with lid, 24-oz
- 20 Marbles

Teacher

- 1 Student Investigation Sheet 2A: *What Are the States of Matter?* (Teacher's Version)
- 1 Balloon
- 1 Glass beaker (100 mL) filled with ice
- 1 Glass beaker (100 mL) filled two-thirds with water
- 3 Clear containers of different shapes, filled with equal volumes of water*
- 3 Clear plastic containers with lids, 24 oz
- 3 Colors of food coloring*
- 1 Graduated cylinder, 1,000 mL
- 1 Hot plate*
- 1 Modeling-clay lump (shape and size to resemble the small, rigid, solid object below)
- 1 Oven mitt*
- 1 Pair of safety goggles*
- 1 Resealable plastic bag, 1 gal*
- 1 Small, rigid, solid object* (e.g., a plastic toy car)
- 1 Thermometer
- Chart paper or whiteboard*
- Marbles
- Markers*

*These materials are needed but not supplied.

1. Distribute a copy of Student Investigation Sheet 2A: *What Are the States of Matter?* to each student. As a brief review, instruct students to complete the first two rows of the chart individually. Ask students to share their responses.

2. Conduct Demonstration #1 where all students can observe. During the demonstration, allow students to ask questions to refine their understanding of these three states of matter.

a. Solids: Display the toy car and the lump of modeling clay. Squeeze the lump of modeling clay to change its shape. Ask:

- What did you observe when I squeezed each solid object? *(The clay changed shape, but the car did not.)*
- Did the masses of these solid objects change? Did the volumes change? *(No, the mass and volume did not change. If students do not recognize this, you may wish to form the clay back into a ball, and measure the mass and volume of both the clay and the car in front of the class. Squeeze the clay again and remeasure to demonstrate there is no change in mass or volume.)*
- Recall from the previous lesson that all matter is made of tiny building blocks called particles. If the volume or mass did not change, do you think the number of particles making up each object changed when the objects were squeezed? Explain your answer. *(No, because adding or removing particles would cause the object's volume or mass to change.)*

b. Liquids: Display the three containers of colored water you prepared, and ask students to observe the volume of liquid in each container. Pour the water from the containers of different shapes into three identical clear plastic containers to demonstrate that the quantities of liquid have equal volume. Pour the water back into the original containers to demonstrate that the volume stays the same but the liquid takes the shape of the container. Ask:

- What did you notice about the volume of each liquid? *(Students should notice that it looked like the volumes of the three liquids were different because the water levels were unequal, but when the liquids were poured into identical containers, it was obvious that they all had the same volume.)*
- What can you conclude about the volume of a liquid and the shape of its container? *(A liquid takes the shape of its container, but its volume does not change when the size of the container is changed.)*

c. Gases: Gently squeeze the balloon to demonstrate that the gas inside changes shape with the balloon. Do the same with the bag of air, and then open the seal to demonstrate that the air leaves the bag and disperses into the room. Ask:

- What did you notice when I squeezed the balloon and the bag of air? *(The gas seemed to move around inside both the balloon and the bag.)*
- How did the bag of air change when I opened it? Predict what happened to the gas inside. *(Students should predict that because the bag seemed to deflate when it was opened, the air left the bag.)*

3. Write the following statements on the board in a single column:

- A material that has definite shape and volume.
- A material that has definite volume but takes the shape of its container.
- A material that has no definite shape or volume and can expand freely to fill a container of any size or shape.

In a second column, write "solid," "liquid," and "gas." As a class, match each state of matter to one of the descriptions you wrote on the board. Instruct students to copy the descriptions into the first row of Student Investigation Sheet 2A.

Teaching Tip

Students may struggle to understand that solids like modeling clay have a definite shape. Explain that the modeling clay is malleable, or can change its shape, but that the individual particles that make up the modeling clay do not change in shape.

4. Explain that the next demonstration will utilize the same type of matter, water, in three different states. Students will observe phase changes, or the changes from one state of matter to another. Provide a pair of safety goggles for each student. Once you and the students have the goggles on, display the beaker of ice cubes and the beaker of water. Pour a little water from the water beaker into the beaker of ice and insert the thermometer. Measure the temperature of the ice water and record it on the board.

Teaching Tip

Dispel misconceptions that a material's temperature is increased only by extremes such as boiling or cooking. Bringing a glass of ice to room temperature is also an example of heating the material.

5. Place the beaker on a hot plate and begin to heat the ice water. Record the temperature every minute until all the ice has melted and the water is at a full boil. As the beaker heats up, ask students to observe what is happening and share their observations with the class. Students should notice that as the hot plate raises the temperature, the ice melts into water. The liquid water begins to boil, and some of the water turns into water vapor.

Teaching Tip

Exercise caution when using the hot plate. Do not touch or allow students to touch the hot plate. Also use caution when handling the beaker. Use an oven mitt or allow the beaker to cool completely before handling.

6. Turn off the hot plate and provide time for students to discuss what they observed in their groups. After some time, facilitate a class discussion using the following questions:

- How did the water change during this demonstration? How many phase changes occurred? *(Students should be able to identify two state changes: Ice was heated until it became water. Water was boiled until it become water vapor.)*
- What pattern do you notice with these phase changes? *(Both of the phase changes were the result of adding heat.)*
- How can you make ice? *(Freeze water.)*

Lesson in instructional resource

Teaching Tip

Make sure students understand that heat energy was added to cause the phase changes they observed. Explain that when water is frozen, heat energy is removed from the system.

7. Discuss melting point, freezing point, and boiling point. Write the following definitions on the board. Direct students to copy each into their science notebooks.

a. A material's freezing point is the temperature at which it changes from a liquid to a solid. For water, this is 0°C (32°F).

b. A material's melting point is the temperature at which it changes from a solid to a liquid. For water, this is 0°C (32°F).

c. A material's boiling point is the temperature at which it changes from a liquid to a gas. For water, this is 100°C (212°F).

Encourage students to provide examples of phenomena related to these terms, such as creating popsicles, melting ice cream, or steaming soup.

8. Ask students if they observed any particles during the demonstration. Make sure students understand that particles are too small to be seen with the eye and require a powerful microscope to view. Ask:

- Think about the ice, water, and vapor. Are these materials made of the same particles? *(Yes)*
- Do you think the number of particles changed as the water changed state? *(Answers will vary. Explain that the number of particles did not change.)*

9. Distribute 20 marbles and a clear plastic container to each group. Instruct students to work in groups of four to develop a model to describe the movement and attraction of the particles in each state of matter. Provide the following rules for students:

- You must demonstrate how particles become more or less attracted while changing from a solid to a liquid to a gas.
- You may use the container or the surface of your desk to demonstrate each state of matter.

Teaching Tip

Instruct students to shake their containers quietly and to make sure the floor is clear of marbles at the end of the investigation. You may want to provide a shallow box if the desks are not flat.

10. Provide time for groups to develop their models. Allow students to struggle with the challenge before intervening, but use the following question to guide students toward an understanding particle behavior:

- Think about adding energy to something, like we added heat energy to ice and water. What typically happens when something has more energy? *(Objects with more energy tend to move faster than objects with less energy. Guide students to this conclusion by asking them to describe the behavior of a person who has a lot of energy.)*

11. Allow each group to share its model. Draw attention to similarities and differences among the models, but identify models that accurately show particles becoming less attracted and moving faster. Once all groups have shared, ask:

- What happens to particles' attraction and movement as energy is added to a system of matter? *(The particles become less attracted and move faster.)*
- Relate the models to the definitions of each state of matter. *(Students' models will vary, but they should be able to describe how their model represents the following: Solids keep their shape, so their particles are strongly attracted and do not move very much. Liquids maintain the same volume but can take the shape of their container, so their particles have less attraction and more movement. Gases have no definite shape or volume and can spread out, suggesting they are less attracted and move around the most.)*

12. Draw on the board a simple diagram of these particle arrangements. Use Figure 2.1 as a reference.

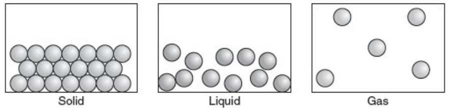
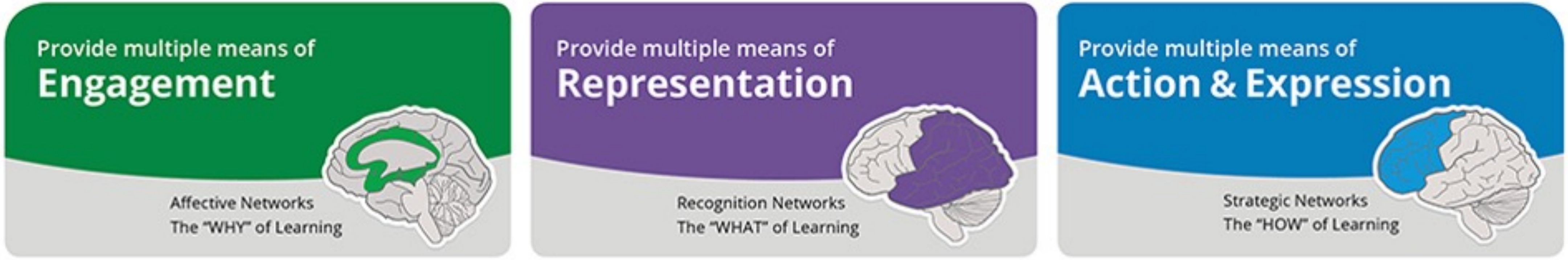


Figure 2.1: Particles are arranged differently in solids, liquids, and gases.

Universal Design for Learning: Lesson Design



Guiding Unit Question:

Lesson Goal(s):

Date

Connecting Activity:

Additional supports & strategies to ensure students meet the "ALL"

Mini Lesson:

Processing Task:

I need to…	I must…	I can…	I could…	I can try to…
Access	All	Most	Few	Challenge

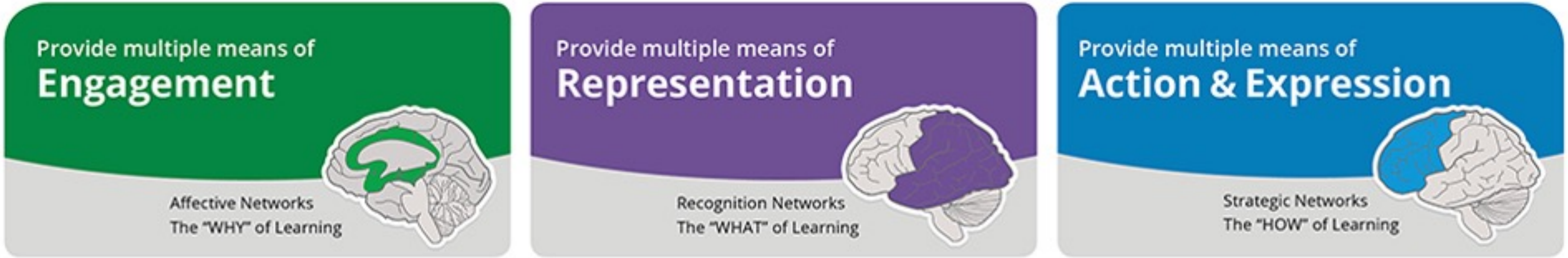
Transforming & Personalizing Activity:

This is lesson creates evidence for:

Dr. Shelley Moore, 2024

Universal Design for Learning: Lesson Design

Mini Lesson



Connecting Phase

Processing Phase →

Transforming & Personalizing Phase

Guiding Unit Question: How can I use a model to help me understand that some matter is made up of particles that are too small to see?

Lesson Goal(s): I know that matter can be broken apart into tiny particles that are too small to see

Date

Connecting Activity: picture set
What do all these pictures have in common: states of matter

Mini Lesson: students watch a demonstration experiment (3 beakers)

Processing Tasks – graphic organizer connected to demonstration

I need to…	I must…	I can…	I could…	I can try to…
Watch a science demonstration Draw what you observe and label it with vocab words	Label which beaker is solid, liquid, gas	Draw the arragnement of particles in each state of matter	Show how the particles move in each drawing	Explain how particles break down in this experiment (E.g., What did we do to the matter)
Access	All	Most	Few	Challenge

Transforming & Personalizing Activity: Exit Slip (post it notes or partner share)
One new word you learned today?
What is one new idea you learned today?
What is an example of solid/liquid/gas?

Additional supports & strategies to ensure all students meet the "ALL"
- Provide vocab list, sentence stems, options for verbal explanation

This is lesson creates evidence for: 5-PS1-1 (NGSS)

Backwards Design Planning

Grade: 5	Subject Area: Science	Strand/Topic: Structure and Properties of Matter
Learning Standard: 5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen		**Unit Guiding Question(s):** How can I use a model to help me understand that some matter is made up of particles that are too small to see?
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Disciplinary Core Ideas (knowledge)	**PS1.A: Structure and Properties of Matter** Matter of any type can be subdivided into particles that are too small to see matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations including the inflation and shape of a balloon and the effects of air on larger particles or objects.	• I know that matter can be broken apart into tiny particles that are too small to see • I know that even if tiny particles are too small for my eyes to see, there are other ways to observe them • I know that a model is a way to observe tiny particles too small to see • I know some examples of models that can help me observe tiny particles that are too small to see
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Next Generation Science Standards (NGSS)		
Subject Area: Science	**Strand: Matter and Its Interactions**	**Grade: 5**

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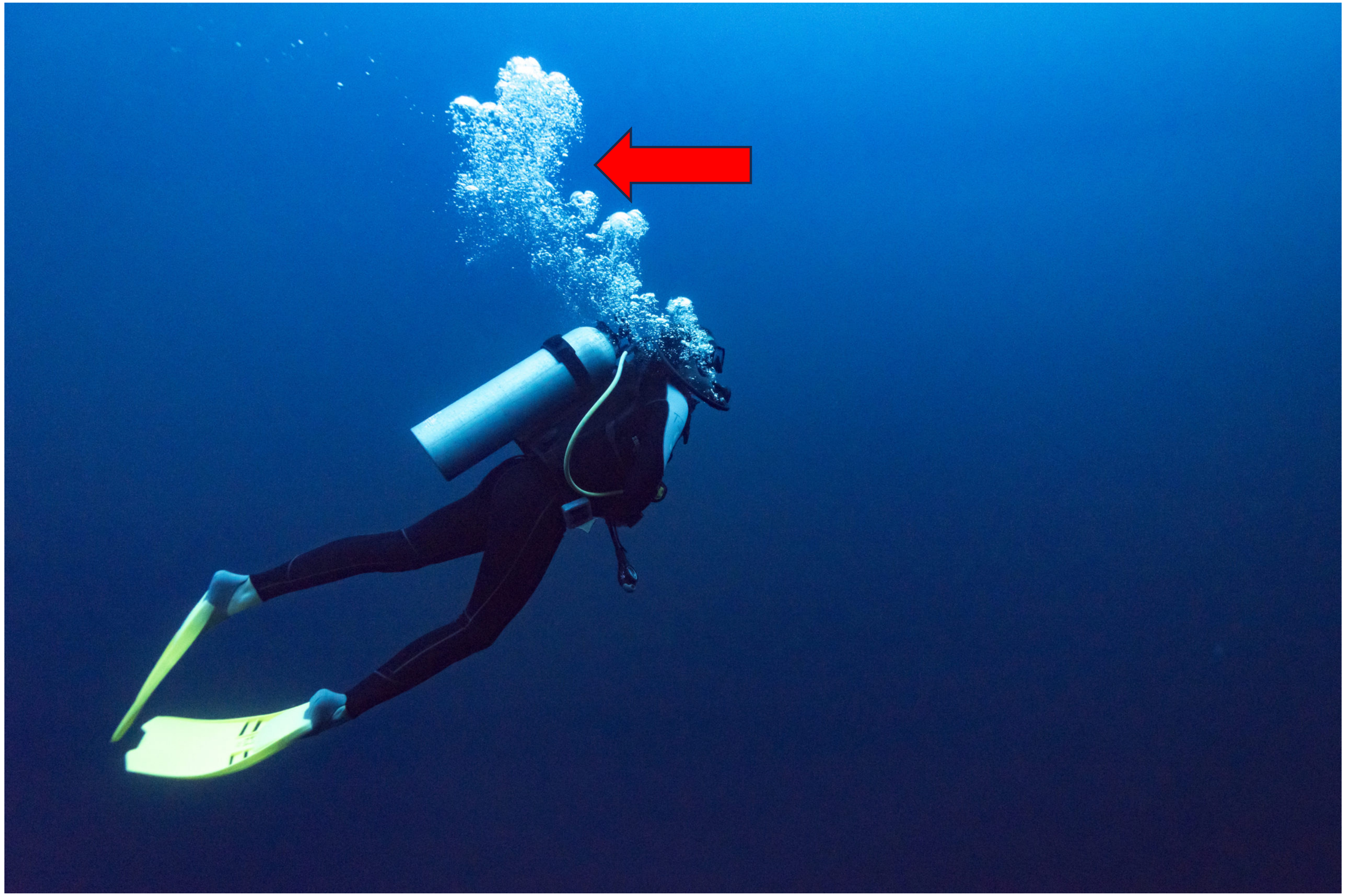
Crosscutting Concepts	I know that objects in the world can be very large and very small by:	describing objects in the world that are very small and very large	describing what microscopic and macroscopic is and examples of each in the world	describing what is similar and what is different between microscopic and macroscopic objects in the world	describing what scale is and how it helps us understand microscopic and macroscopic objects

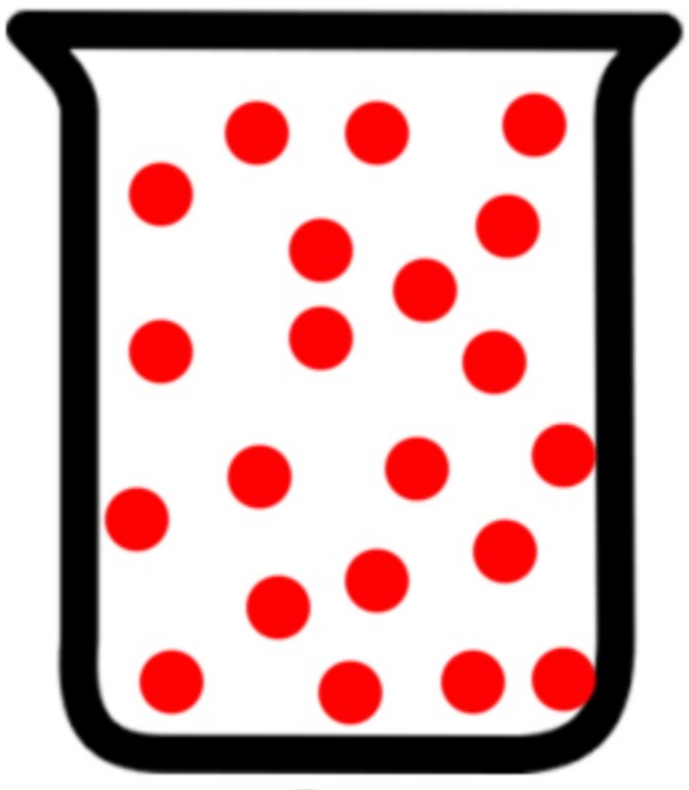
***Description: can include but are not limited to written, oral, pictorial, and kinesthetic**

Describe what you see.



What do you notice?

Describe what you see.



How does this image connect to the other image?

Describe what you see.

How is this image different or the same as the other images?

Describe what you see.

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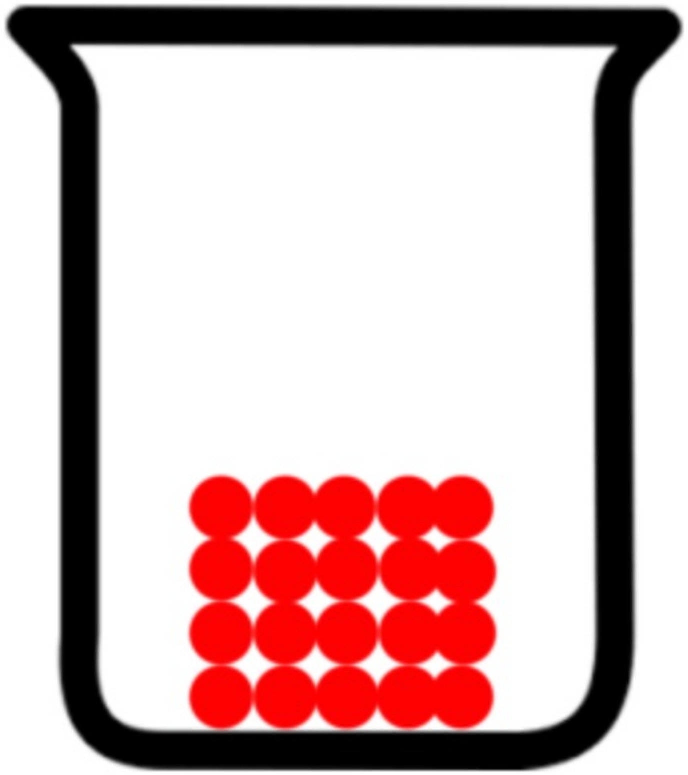

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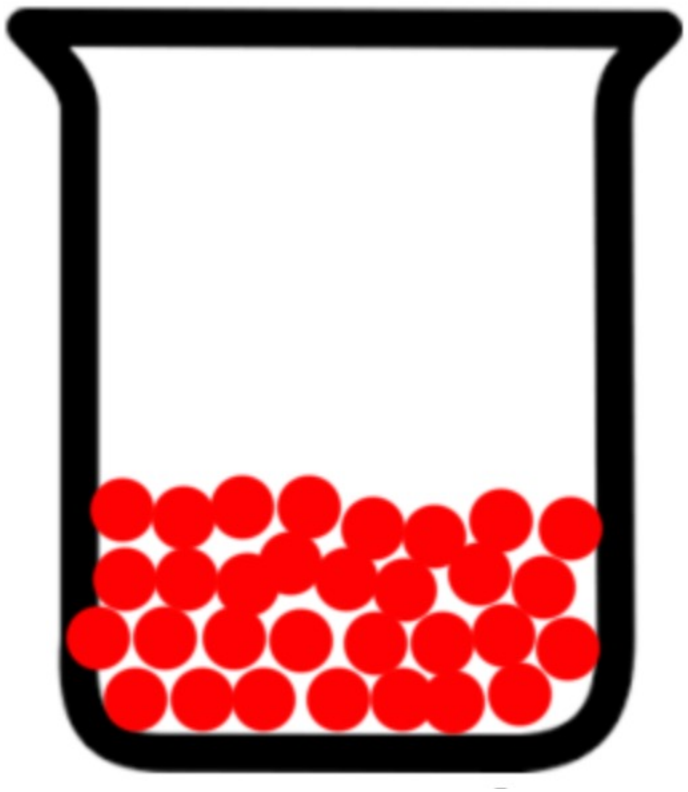
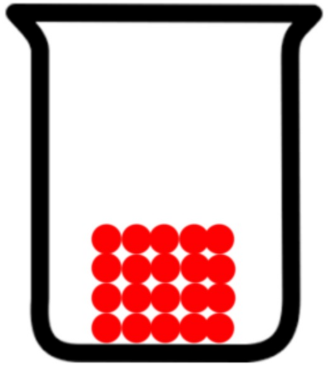
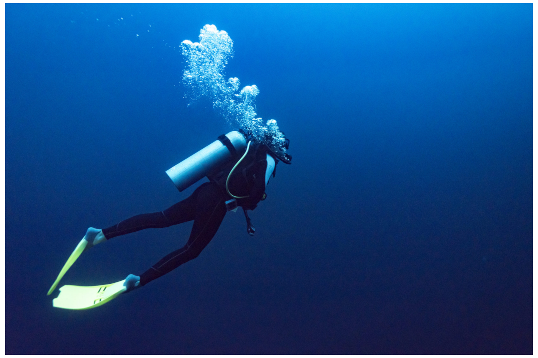
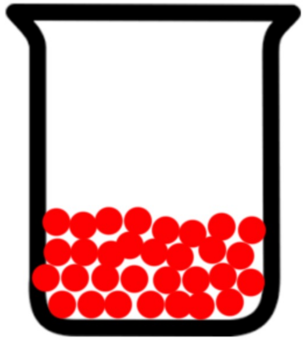


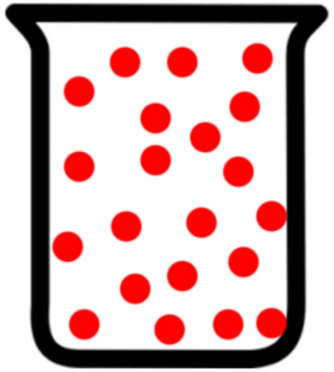
How is this image different or the same as the other images?

What do all these images have in common?









This is activity is connected to: 5-PS1-1 (NGSS)

Dr. Shelley Moore, 2024

All the images are different
states of matter

SOLID

LIQUID

GAS

Our Learning Goal: I know that matter can be broken apart into tiny particles that are too small to see

SOLID

LIQUID

GAS

Dr. Shelley Moore, 2024

UDL Lesson Plan: Connect Phase

Universal Strategies	UDL Indicators Targeted	Support Needs Impacted	Students in Mind
Picture set	7.2, 8.3, 1.1, 1.2, 1.3, 2.4, 2.5, 3.1, 3.2, 3.3, 3.4, 4.1, 5.1, 5.3	Attention, anxiety, communication, engagement/ motivation, executive functioning, intellectual ability, language, literacy, memory, self regulation, self esteem, social skills	GA, MA, LB, JA, ES, RM, NS, KR, TP, AD
Highlighting key words	2.1, 2.4, 3.1, 3.2, 3.4, 5.2	Communication, engagement/ motivation, executive functioning, intellectual ability, literacy, language, memory, self regulation, self esteem,	GA, LB, ES, NS
Student Friendly Learning Goal	8.1, 3.2, 3.4, 6.1, 6.4	Anxiety, communication, engagement/motivation, executive functioning, intellectual ability, literacy, memory, self regulation, self advocacy	GA, MA, LB, JA, ES, ES, KR, GS, MA

Demonstration

UDL Lesson Plan: Mini Lesson Phase

Universal Strategies	UDL Indicators Targeted	Support Needs Impacted	Students in Mind
Modelling (concrete learning)	1.1, 1.2, 1.3, 2.4, 3.1, 3.2, 3.3, 7.3	Attention, Communication, Engagement, Intellectual Ability, Literacy, Memory, Self Regulation,	JA, RM, LB, ES, NS, GA, MA, KR, TP, AD

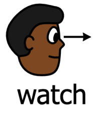
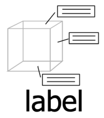
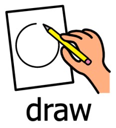
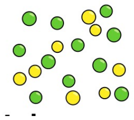
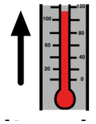
Guiding Question: How can I use a model to help me understand that some matter is made up of particles that are too small to see?

Learning Goal: I know that matter can be broken apart into tiny particles that are too small to see

Task: Observe a science demonstration

Everyone starts together

Go as far as you can!

I **NEED** to:	• Watch the science demonstration • Create a diagram that shows the science demonstration that you watched	
I **MUST**:	• Label your diagram with vocabulary words	
I **CAN**:	• For each state of matter, draw the tiny particles that are too small to see	
I **COULD**:	• Show on your drawing, how the tiny particles move	
I can **TRY** to:	• Using words and drawings, show what made the break down the tiny particles	

Graphic Organizer in instructional resources

Student Investigation Sheet 2A Name ____________

What Are the States of Matter? Date ____________

	Solid	Liquid	Gas
Definition			
Examples			
Description of arrangement of particles			
Drawing of arrangement of particles			

MUST/CAN/COULD Graphic Organizer

Guiding Question: How can I use a model to help me understand that some matter is made up of particles that are too small to see?

Learning Goal: I know that matter can be broken apart into tiny particles that are too small to see	
Name:	Date:
Need: Watch the science demonstration. Create a diagram that shows the science demonstration that you watched.	Must: Label your diagram with vocabulary words: matter solid liquid gas beaker heat water ice steam

Guiding Question: How can I use a model to help me understand that some matter is made up of particles that are too small to see?

Learning Goal: I know that matter can be broken apart into tiny particles that are too small to see	
Name:	Date:
Can: For each state of matter, draw the tiny particles that are too small to see Could: Show on your drawing, how the tiny particles move	Can Try: Using words and drawings, show what was used to make the tiny particles move ____________________ ____________________ ____________________

Vocab List

Guiding Question: How can I use a model to help me understand that some matter is made up of particles that are too small to see?

Learning Goal: I know that matter can be broken apart into tiny particles that are too small to see

Name:

Date:

Need: Watch the science demonstration. Create a diagram that shows the science demonstration that you watched.

Must: Label your diagram with vocabulary words:

matter

solid

liquid

gas

beaker

heat

water

ice

steam

Guiding Question: How can I use a model to help me understand that some matter is made up of particles that are too small to see?

Learning Goal: I know that matter can be broken apart into tiny particles that are too small to see

Name:	Date:

Can: For each state of matter, draw the tiny particles that are too small to see

Could: Show on your drawing, how the tiny particles move

Can Try: Using words and drawings, show what was used to make the tiny particles move

____

____

____

This is activity is evidence for: 5-PS1-1 (NGSS)

Dr. Shelley Moore, 2024

Next Generation Science Standards (NGSS)		
Subject Area: Science	**Strand: Matter and Its Interactions**	**Grade: 5**

Performance Expectation: 5-PS1-1 **Students can develop a model to describe that matter is made of particles too small to be seen**	**Guiding Unit Question:** How do we know that something exists if we cannot see it?
Unit Vocabulary (Content): properties, structures, scale, proportion, quantity, models, particles, bulk matter,	**Unit Vocabulary (Skills):** make, observe

Foundations	Student Friendly Language	Access Point	Essential	Confident	Extend
Science & Engineering Practices	I can make a model to help me understand an idea by:	following/ participating in creating a model	planning and creating a model	creating a model to solve a problem	Adjusting or revising a model I have created
Disciplinary Core Ideas	I know that matter is made up of particles that are too small to see by: I know that models can help us see particles that are too small to see by:	describing what matter is describing that there are different states of matter describing examples of different kinds of matter in the world	describing what bulk matter is describing that matter (that I can see) is made up of tiny particles (that are too small to see) describing examples of models that help to observe particles that are too small to see	describing how collecting many tiny particles can help us observe how matter takes up space describing which part of the model is bulk matter, and which part of the model is particles	describing the relationship between matter and particles using the model to describe the relationship between matter and how particles move when they are collected
Crosscutting Concepts	I know that objects in the world can be very large and very small by:	describing objects in the world that are very small and very large	describing what microscopic and macroscopic is and examples of each in the world	describing what is similar and what is different between microscopic and macroscopic objects in the world	describing what scale is and how it helps us understand microscopic and macroscopic objects

***Description: can include but are not limited to written, oral, pictorial, and kinesthetic**

UDL Lesson Plan: Processing Phase

Universal Strategies	UDL Indicators Targeted	Support Needs Impacted	Students in Mind
Scaffolded Processing Task	7.1, 8.1, 8.2, 8.4, 9.1, 9.3, 4.1, 5.3, 6.1, 6.4, 3.1, 2.1, 3.2,	Attention, Anxiety, Engagement, Frustration, Intellectual Ability, Literacy, Self-Regulation, Self Esteem, Executive Functioning, Memory, Transitioning	JA, RM, GA, LB, ES, KR, GS, NS, MA, BW, IM, MB
MUST/ CAN/ COULD Task checklist	2.4, 2.1, 3.1, 3.2, 3.3, 7.1, 7.3, 8.1, 8.2, 8.4, 9.1, 9.2, 9.3, 5.3, 6.1, 6.3, 6.4	Attention, Anxiety, Engagement, Frustration, Intellectual Ability, Literacy, Self-Regulation, Self Esteem, Executive Functioning, Memory, Transitioning, Self Advocacy, Literacy	JA, RM, GA, LB, ES, KR, GS, NS, MA, BW, IM, MB, TP, AD
MUST/ CAN/ COULD graphic organizer	5.1, 5.3, 6.1, 6.2, 6.3, 6.4, 7.1, 8.1, 8.2, 8.4, 9.1, 9.3, 1.1, 2.1, 2.3, 2.4, 3.1, 3.2, 3.4	Attention, Anxiety, Communication, Engagement, Frustration, Intellectual Ability, Literacy, Self-Regulation, Self Esteem, Executive Functioning, Memory, Transitioning, Self Advocacy, Literacy	JA, RM, GA, LB, ES, KR, GS, NS, MA, BW, IM, MB, TP, AD
Vocab list	1.1, 1.2, 1.3, 2.1, 2.3, 2.4, 3.2, 4.1, 4.2, 5.2, 7.3,	Attention, Anxiety, Communication, Engagement, Frustration, Intellectual Ability, Language, Literacy, Memory, Self regulation, Self Esteem	JA, RM, GA, LB, ES, KR, GS, NS, MA, BW, IM, MB, TP, AD

UDL Lesson Plan:
Transforming & Personalizing Phase

Universal Strategies	UDL Indicators Targeted	Support Needs Impacted	Students in Mind
Exit Slip Reflection	3.4, 6.4, 5.1, 9.3	Communication, Engagement, Intellectual Ability, Literacy, Self Regulation	JA, RM, GA, LB, ES, KR, GS, NS, MA, BW, IM, MB

Combining Standards Based Grading and Curriculum Mapping

Standards Based Grade Book (Content)										
Learning Standards										
Possible Evidence of Learning										
Reporting Language	Approaching/ Access Point	Emerging/ Essential	Developing	Confident	Extending	Approaching/ Access Point	Emerging/ Essential	Developing	Confident	Extending
Evaluation	I/IEP	2	2+/3	3/3+	4	I/IEP	2	2+/3	3/3+	4
Student 1										
Student 2										
Student 3										
Student 4										
Student 5										

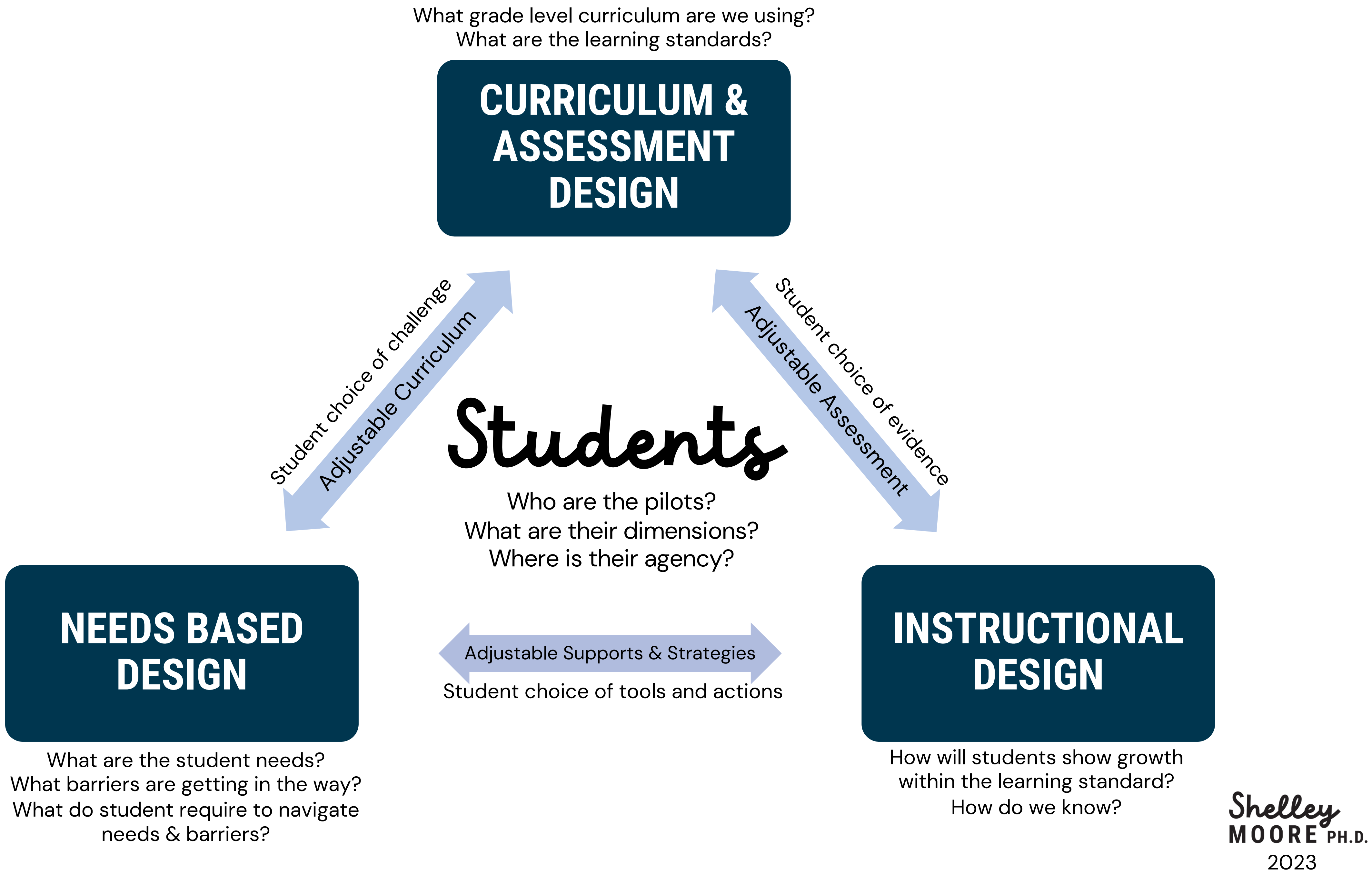
Grade 4/5 Math Standards Based Gradebook

	Content Goals									
Learning Standards	Ordering and comparing fractions (4)					Equivalent fractions (5)				
Possible Evidence of Learning										
Reporting Language	Approaching/ Access Point	Emerging/ Essential	Developing	Confident	Extending	Approaching/ Access Point	Emerging/ Essential	Developing	Confident	Extending
4- Point	IE/IEP	2	3	3.5	4	IE/IEP	2	3	3.5	4
Student 1	•	•				•	•			
Student 2	•	•	•	•	•	•	•			
Student 3	•	•	•			•	•			
Student 4		•	•	•		•	•		•	
Student 5	•	•	•	•		•	•	•		

	Curriicular Competency Goals									
Learning Standards	Develop mental math strategies and abilities to make sense of quantities (4/5)					Visualize to explore mathematical concepts (4/5)				
Possible Evidence of Learning										
Reporting Language	Approaching/ Access Point	Emerging/ Essential	Developing	Confident	Extending	Approaching/ Access Point	Emerging/ Essential	Developing	Confident	Extending
4- Point	IE/IEP	2	3	3.5	4	IE/IEP	2	3	3.5	4
Student 1	•	•				•	•			
Student 2	•	•	•	•		•	•	•	•	
Student 3	•	•				•	•	•	•	
Student 4	•	•	•	•	•		•	•	•	
Student 5	•	•	•			•	•			

	Curriicular Competency Goals									
Learning Standards	Communicate mathematical thinking in many ways (4/5)					Connect mathematical concepts to each other and to other areas and personal interests (4/5)				
Possible Evidence of Learning										
Reporting Language	Approaching/ Access Point	Emerging/ Essential	Developing	Confident	Extending	Approaching/ Access Point	Emerging/ Essential	Developing	Confident	Extending
4- Point	IE/IEP	2	3	3.5	4	IE/IEP	2	3	3.5	4
Student 1	•	•				•	•			
Student 2	•	•	•	•		•	•	•	•	
Student 3	•		•			•	•	•		
Student 4	•	•				•	•			
Student 5	•	•				•	•			

	Evaluation				
	Total	Out of	%	Letteer Grade	4 - Point
4- Point	24	24			
Student 1	12	24	50	C-	2
Student 2	20	24	83	B	3+
Student 3	IE	24			
Student 4	IE	24			
Student 5	15.5	24	65	C-	2+


What grade level curriculum are we using?
What are the learning standards?
CURRICULUM & ASSESSMENT DESIGN
Student choice of challenge
Adjustable Curriculum
Student choice of evidence
Adjustable Assessment
Students
Who are the pilots?
What are their dimensions?
Where is their agency?
NEEDS BASED DESIGN
Adjustable Supports & Strategies
Student choice of tools and actions
INSTRUCTIONAL DESIGN
What are the student needs?
What barriers are getting in the way?
What do student require to navigate needs & barriers?
How will students show growth within the learning standard?
How do we know?
Shelley MOORE PH.D.
2023

What are the barriers?

What are the needs?

How were barriers reduced/eliminated

How were needs met/ managed?

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FINAL REFLECTIONS

What is one useful idea?

What is one thing you want to try?

What is a question that you have?

What is one thing you want to learn more about?

What is one thing you want to share with someone who is not here today?

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