MARZANO RESEARCH LABORATORY

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Acquiring Knowledge

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The Marzano/Wenatchee Connection:

Marzano's Design Questions 2, 3, 4, (5):
DQ2: What will I do to help students effectively interact with new knowledge?
DQ3: What will I do to help students practice and deepen their understanding of new knowledge?
DQ4: What will I do to help students generate and test hypotheses about new knowledge?
(DQ5: What will I do to engage students?)
Wenatchee Criterion 2: Demonstrating effective teaching practices.
2.1: The teacher facilitates the acquisition of new knowledge: The teacher helps students effectively interact with, practice and deepen their understanding of, generate and test hypotheses about new knowledge through various methods to engage students.

Reference: Marzano, R. J. (2007). *The art and science of teaching: a comprehensive framework for effective instruction*. Alexandria, Va.: Association for Supervision and Curriculum Development

What will I do to help students effectively interact with new knowledge?

❑ As students interact with new knowledge (including information and skills and procedures), they benefit from carefully constructed input experiences.
❑ Key design principles associated with effective "critical-input" experiences include: (1) using a variety of modalities (visual, dramatic, verbal); (2) previewing; (3) presenting information in small, "brain-compatible" chunks (i.e., not overwhelming students with too much initial information); (4) active processing using "macro-strategies" (e.g., summarizing and note-taking, non-linguistic representations, higher-order questioning, student reflection and self-regulation, and cooperative learning)

Action Step 1: *Identify critical-input experiences.*

❑ Design learning experiences that present new content (declarative or procedural) to students in such a way that they are "hooked" and engaged—and clearly understand both what they are learning and why they are learning it.
❑ Use a combination of modalities (visual instruction, dramatic instruction, and verbal instruction) to reinforce students' understanding and ownership of new content.

Action Step 2: *Preview the content prior to a critical-input experience.*

❑ Help students to start thinking about new content and why they are learning it.
❑ Ausubel (1998) and others recommend using "advance organizers" to help students understand the purpose of learning new knowledge and how it is organized (e.g., outlines, syllabus, essential questions).
❑ Use cueing strategies, providing students with direct links between new content and content previously taught and learned.
❑ Specific previewing strategies include: (1) What Do You Think You Know? (2) Overt Linkages (3) Preview Questions (4) Brief Teacher Summaries (5) Skimming (6) Teacher- Prepared Notes.

Action Step 3: *Organize students into groups to enhance the active processing of information.*

❑ Cooperative learning allows students to experience content from multiple perspectives.
❑ Group interaction not only facilitates knowledge development but also creates awareness that is difficult if not impossible to achieve without interaction.
❑ According to Marzano, pairs and triads are most effective in processing information.
❑ Help students to acquire, integrate, and apply operating rules essential to group success, e.g., (1) Be willing to add your perspective to any discussion. (2) Respect the opinions of other people. (3) Make sure you understand what others have added to the conversation. Be willing to ask questions if you don't understand something. (4) Be willing to answer questions other group members ask you about your ideas.

Action Step 4: *Present new information in small chunks and ask for descriptions, discussion, and predictions*

❑ The most effective teachers use "small steps" in presenting new material. Our working memory—where we process new information—is small and can handle only a few bits of information at one time—Too much swamps our working memory.
❑ Students need to actively process new content using such processes as describing, discussing, and making predictions.
❑ Part of this active process should involve "macro-strategies" designed to increase students' abilities to (1) cumulatively review information read, (2) sequence information, (3) summarize paragraphs and issues, (4) state main ideas in as few words as possible, and (5) predict and check outcomes. (Barley et al., 2002, p. 84 [Marzano, p. 35].
❑ Additional macro-strategies include summarizing and note taking, esp. three-column notes: (1) running notes; (2) summaries and highlights of big ideas, terms, and questions; and (3) non-linguistic representations.
❑ As part of their work with macro-strategies, students should be encouraged to encode information in non-linguistic and visual form (e.g., mental images, graphic organizers, physical models, pictographs), including student-constructed mnemonic devices.
❑ Macro-strategies also include: (1) various forms of higher-level questioning (e.g., inferential, elaborative interrogation, predictive) and (2) student reflection (e.g., reviewing critical-input experiences and identifying points of confusion and levels of certainty).
❑ Marzano also reinforces the value of the following: (1) reciprocal

teaching, (2) cooperative learning JIGSAWS, and (3) concept attainment.

Action Step 5: *Ask questions that require students to elaborate on information.*

❑ Throughout *The Art and Science of Teaching,* Marzano reinforces the value of higher- order questions, including: (1) general inferential questions (e.g., default questions requiring students to use their own background knowledge and (2) questions requiring students to reason logically with information presented.

❑ Elaborative interrogations extend initial inferential responses to include: (1) Why do you believe this to be true? and (2) Tell me why you think that is so. They can also include: (3) What are some typical characteristics or behaviors you would expect of _____ ? (4) What would you expect to happen if _____ ?

Action Step 6: *Have students write out their conclusions or represent their learning non- linguistically.*

❑ As students extend and refine their knowledge of new content, they can more deeply process new information by using one of five strategies: (1) three-column notes (running notes, summaries, visual representations; (2) graphic organizers (e.g., characteristic patterns, sequence patterns, process/cause patterns, problem/solution patterns, and generalization/supporting detail patterns); (3) dramatic enactments, (4) mnemonic devices employing imagery (e.g., symbols and substitutes, rhyming pegwords, link strategies); and (5) academic notebooks (a compilation of entries that provide partial records of instructional experiences a student had in her or his classroom for a certain period of time, Ruiz-Primo, Li, and Shavelson, 2001, P. 56 of Marzano).

Action Step 7: *Have students reflect on their learning.*

❑ At the completion of critical-input experiences, ask students to actively process information learned.

❑ Useful reflective questions (Cross, 1998; Ross, Hogaboam-Gray & Rolheiser, 2002, p. 57) include: (1) What were you right and wrong about? (2) How confident are you about what you have learned? (3) What did you do well during your learning experience and what could you have done better?

Observations, Reflections, Questions (*New Knowledge*):

I am interested in learning more about the following strategies to enhance students' critical-input experiences:

_____
_____
_____
_____

My students might benefit if I did more with the following previewing strategies:

_____
_____
_____
_____

I should explore the following strategies for organizing students into groups to enhance their active processing of information:

_____
_____
_____
_____

The following strategies seem promising for presenting new information in small chunks and asking students for descriptions, discussion, and predictions:

_____
_____
_____
_____

I should expand my emphasis on the following elaborative questioning strategies:

_____
_____
_____
_____

My students need to do more with using the following strategies designed to help them write their conclusions and represent their learning non-linguistically:

_____
_____

_____
_____

My students can improve their ability to reflect on their own learning by:

_____
_____
_____
_____

Additional Thoughts:

What will I do to help students practice and deepen their understanding of new knowledge?

- ❑ Actively processing information is the beginning point of learning.
- ❑ Students should be engaged in the active construction of knowledge and understanding via: (1) schema development (accretion and tuning, i.e., gradual accumulation or addition of knowledge over time and the expression of that knowledge in more parsimonious packages) and restructuring (Piaget's accommodation, i.e., reorganizing knowledge so that it might produce new insights).
- ❑ Students deepen their understanding of procedural knowledge (i.e., skills, procedures, processes) through a process of initial modeling followed by shaping (guided practice involving rehearsal and correction of missteps and misunderstandings) and eventual internalization (i.e., automaticity, i.e., independent application and automatic conceptual transfer).
- ❑ Students deepen their understanding of declarative knowledge (i.e., information such as facts, concepts, generalizations, rules, theories, principles) through reviewing and revision via the processes of constructing meaning, organizing information mentally, and storing key information in long-term memory.
- ❑ Homework can be extremely useful in helping students to practice and deepen their understanding of new knowledge when it is designed to help students extend and refine their learning (with reasonable time requirements, clear purpose, clear alignment with identified learning goals, allowance for independent performance, and assurance that it is commented upon and used as part of the teaching-learning process when it is due).

Action Step 1: *Provide students with tasks that require them to examine similarities and differences.*

- ❑ Have students identify and analyze similarities and differences using such strategies as: (1) sentence stems; (2) visual organizers (e.g., Comparison Charts, Venn Diagrams, Double Bubble); (3) classification activities (e.g., classification charts and matrices); and (4) creating metaphors and analogies.

Action Step 2: *Help students to identify errors in their thinking.*

- ❑ Teach students to analyze and evaluate faulty logic (e.g., contradiction, accident, false cause, begging the question, evading the issue, arguing from ignorance, composition/ division).

❑ Teach students to analyze and evaluate "attacks" (e.g., poisoning the well, arguing against the person, appealing to force).
❑ Teach students to identify, analyze, and evaluate the impact of weak reference (e.g., sources that reflect biases, sources that lack credibility, appealing to authority, appealing to the people, appealing to emotion).
❑ Teach students to identify and evaluate the impact of misinformation (e.g., confusing the facts, misapplying a concept of generalization).

Action Step 3: *Provide opportunities for students to practice skills, strategies, and processes.*

❑ Initially provide structured practice sessions spaced close together.
❑ Provide practice sessions that are gradually less structured and more varied.
❑ When appropriate, provide practice sessions that help students develop fluency (including a fairly wide array of exercises so as to expose students to different contexts in which the procedure might be executed. Additionally, the teacher should consider accuracy and speed in these practice sessions along with further shaping of the procedure).

Action Step 4: *Determine the extent to which cooperative groups will be used.*

❑ Use a variety of cooperative learning structures that allow for varied roles and both individual and group accountability.
❑ After individual students have worked through a practice activity, have them meet in small groups to check their work for accuracy and describe their personal approaches to the exercises.

Action Step 5: *Assign purposeful homework that involves appropriate participation from home.*

❑ Use homework for three interrelated purposes: (1) to help students deepen their knowledge, (2) to enhance students' fluency with procedural knowledge, and (3) to introduce new content.

Action Step 6: *Have students systematically revise and make connections in their academic notebooks.*

❑ Ensure that students have multiple exposures to content, allowing them to shape and sharpen their knowledge.
❑ Have students make new entries in their notebooks after homework has been corrected and discussed.

- ❑ Students can reexamine the entries at any point in time—to encourage review of what they have recorded, emphasizing identification of those things about which they were accurate initially and those things about which they were inaccurate initially.
- ❑ Use notebook entries to capture students' awareness and insights they may have not recorded before.
- ❑ Have students compare entries in their notebooks. Members of a review group identify what they agree on as a group, what they disagree on, and questions they still have about the content. In turn, groups can report out to the whole class, with instructor addressing common agreements, disagreements, and questions.

Observations, Reflections, Questions (*Practicing & Deepening*):

My students might benefit if I placed greater emphasis upon the following strategies designed to help their "schema development," ensuring that they organize and store what they are learning in cohesive ways:

My students might benefit if I placed greater emphasis upon the following strategies designed to help them construct meaning about, organize, and store declarative knowledge:

My students might benefit if I placed greater emphasis upon the following strategies designed to help them construct meaning about, organize, and store procedural knowledge:

My students might benefit if I placed greater emphasis upon the following strategies related to our use of homework to enhance learning:

_____
_____
_____
_____

Additional Thoughts:

What will I do to help students generate and test hypotheses about new knowledge?

❑ As students progress beyond basic levels of knowing, they should be engaged in tasks that require them to experiment with the new knowledge, i.e., generating and testing hypotheses about it.

Action Step 1: *Teach students about effective support.*

❑ Help students to understand that valid claims must be supported (grounds); the support should be explained and discussed (backing); and exceptions to the claims should be identified (qualifiers).

❑ Teach students to recognize and assess the impact of limits when analyzing statistical information: (1) regression toward the mean; (2) errors of conjunction; (3) keeping aware of base rates; (4) understanding the limits of extrapolation; and (5) adjusting estimates of risk to account for the cumulative nature of probabilistic events.

Action Step 2: *Engage students in experimental inquiry tasks that require them to generate and test hypotheses.*

❑ Encourage students to make a prediction based on observations and design an experiment to test that prediction—and then examine the results in light of the original prediction.

Action Step 3: *Engage students in problem-solving tasks that require them to generate and test hypotheses.*

❑ Ask students to use knowledge in a highly unusual context or a situation that involves constraints. Challenge students to determine what must be done differently given the unusual context or constraint.

❑ Prior to engaging in a problem-solving task, students should predict how the new context or constraint will affect the situation.

❑ At the conclusion of a problem-solving task, students should restate their predictions and then contrast them with what actually occurred. They should describe their conclusions with well-structured support.

Action Step 4: *Engage students in decision-making tasks that require them to generate and test hypotheses.*

❑ Decision-making tasks require students to select among equally appealing alternatives.

❑ Ask students to begin by identifying alternatives to be considered.
❑ Next, students address the criteria by which alternatives will be judged.
❑ With alternatives and criteria identified, students complete the decision-making process (e.g., using a decision matrix).

Action Step 5: *Engage students in investigation tasks that require them to generate and test hypotheses.*

❑ Investigation is the testing of hypotheses about past, present, or future events.
❑ Historical investigation involves answering questions about what really happened or why did "X" happen?
❑ Projective investigation involves answering questions such as: "What would happen if _____?"
❑ Definitional investigation involves answer questions such as: "What are the important features of _____?" or "What are the defining characteristics of _____?"

Action Step 6: *Have students design their own tasks.*

❑ As students demonstrate growing proficiency and independent understanding of new knowledge, the teacher can encourage them to design their own tasks, asking: (1) Is there a particular experiment you would like to conduct using the information we have been studying? (2) Is there a particular problem you would like to examine using the information we have been studying? (3) Is there a particular decision you would like to examine using the information we have been studying? (4) Is there a particular concept you would like to examine, past event you would like to examine, or hypothetical event you would like to examine using the information we have been studying?

Action Step 7: *Consider the extent to which cooperative learning structures will be used.*

❑ Information gathering for hypothesis generation and testing can be conducted in small groups.
❑ Groups can also work together to organize information, take a position, or related complex processes involved in hypothesis generation and testing.

Observations, Reflections, Questions (*Generating and Testing Hypotheses*):

The following are areas in our school and/or my curriculum where students are already being asked to generate and test hypotheses about new knowledge:

I need to emphasize more the following strategies related to my students' construction of effective support for claims and assertions:

I might enhance students' performance by having them engage in experimental inquiry tasks for the following essential learnings:

I might enhance students' performance by having them engage in problem- solving tasks involving generating and testing hypotheses for the following essential learnings:

I might enhance students' performance by having them engage in decision- making tasks involving generating and testing hypotheses for the following essential learnings:

_____
_____
_____
_____

I might enhance students' performance by having them engage in investigation tasks involving generating and testing hypothese for the following essential learnings:

_____
_____
_____
_____
_____
_____

We might consider the following grade levels or content areas as venues for having students design their own tasks and engage in cooperative learning structures:

_____
_____
_____
_____
_____
_____

Additional Thoughts:

Self-Reflection Scale:

U **Unsatisfactory** = I should use the strategy but I don't or I use the strategy incorrectly or with parts missing.

B **Basic** = I use the strategy with no significant errors or omissions. (But do so in somewhat of a mechanistic way.)

P **Proficient** = I use the strategy and monitor the extent to which it produces the desired outcomes.

D **Distinguished** = I adapt and create new ways of using this strategy for unique student needs and situations.

Engaging in Focused Practice:

- Focus on specific steps of an instructional strategy
- Develop a protocol for a less well-defined strategy
- Develop fluency with a particular strategy
- Make adaptations to an existing strategy
- Integrate several strategies

WHAT WILL I DO TO HELP STUDENTS EFFECTIVELY INTERACT WITH NEW KNOWLEDGE?

Action Steps/Self-Reflection:

1. *Identify Critical-Input Experiences:*

Circle: U B P D

2. *Preview the Content Prior to a Critical-Input Experience:*

Circle: U B P D

3. *Organize Students into Groups to Enhance the Active Processing of Information:*

Circle: U B P D

4. P*resent New Information in Small Chunks and Ask for Descriptions, Discussion, and Predictions:*

Circle: U B P D

5. *Ask Questions That Require Students to Elaborate on Information:*

Circle: U B P D

6. *Have Students Write Out Their Conclusions or Represent Their Learning Non-linguistically:*

Circle: U B P D

7. *Have Students Reflect on Their Learning:*

Circle: U B P D

WHAT WILL I DO TO HELP STUDENTS PRACTICE AND DEEPEN THEIR UNDERSTANDING OF NEW KNOWLEDGE?

Action Steps/Self-Reflection:

1. *Provide Students with Tasks That Require Them to Examine Similarities and Differences:*
   Circle: U B P D

2. *Help Students Identify Errors in Thinking:*
   Circle: U B P D

3. *Provide Opportunities for Students to Practice Skills, Strategies, and Processes:*
   Circle: U B P D

4. *Determine the Extent to Which Cooperative Groups Will Be Used:*
   Circle: U B P D

5. *Assign Purposeful Homework That Involves Appropriate Participation from the Home:*
   Circle: U B P D

6. *Have Students Systematically Revise and Make Corrections in Their Academic Notebooks*
   Circle: U B P D

WHAT WILL I DO TO HELP STUDENTS GENERATE AND TEST HYPOTHESES ABOUT NEW KNOWLEDGE?

Action Steps/Self-Reflection:

1. Teach Students About Effective Support:
   Circle: U B P D

2. Engage Students in Experimental Inquiry Tasks That Require Them to Generate and Test Hypotheses:
   Circle: U B P D

3. Engage Students in Problem-Solving Tasks That Require Them to Generate and Test Hypotheses:
   Circle: U B P D

4. Engage Students in Decision-Making Tasks That Require Them to Generate and Test Hypotheses:
   Circle: U B P D

5. Engage Students in Investigation Tasks That Require Them to Generate and Test Hypotheses:
   Circle: U B P D

6. Have Students Design Their Own Tasks:
   Circle: U B P D

7. Consider the Extent to Which Cooperative Learning Structures Will Be Used:
   Circle: U B P D

S.M.A.R.T. Goals:

Specific: A specific goal has a much greater chance of being accomplished than a general goal. To set a specific goal you must answer the six "W" questions:

*Who: Who is involved?

*What: What do I want to accomplish?

*Where: Identify a location.

*When: Establish a time frame.

*Which: Identify requirements and constraints.

*Why: Specific reasons, purpose or benefits of accomplishing the goal.

EXAMPLE: A general goal would be, "Get in shape." But a specific goal would say, "Join a health club and workout 3 days a week."

Measurable - Establish concrete criteria for measuring progress toward the attainment of each goal you set.

When you measure your progress, you stay on track, reach your target dates, and experience the exhilaration of achievement that spurs you on to continued effort required to reach your goal.

To determine if your goal is measurable, ask questions such as……

How much? How many?

How will I know when it is accomplished?

Attainable – When you identify goals that are most important to you, you begin to figure out ways you can make them come true. You develop the attitudes, abilities, skills, and financial capacity to reach them. You begin seeing previously overlooked opportunities to bring yourself closer to the achievement of your goals.

You can attain most any goal you set when you plan your steps wisely and establish a time frame that allows you to carry out those steps. Goals that may have seemed far away and out of reach eventually move closer and become attainable, not because your goals shrink, but because you grow and expand to match them. When you list your goals you build your self-image. You see yourself as worthy of these goals, and develop the traits and personality that allow you to possess them.

Realistic- To be realistic, a goal must represent an objective toward which you are both *willing* and *able* to work. A goal can be both high and realistic; you are the only one who can decide just how high your goal should be. But be sure that every goal represents substantial progress.

A high goal is frequently easier to reach than a low one because a low goal exerts low motivational force. Some of the hardest jobs you ever accomplished actually seem easy simply because they were a labor of love.

Timely – A goal should be grounded within a time frame. With no time frame tied to it there's no sense of urgency. If you want to lose 10 lbs, when do you want to lose it by? "Someday" won't work. But if you anchor it within a timeframe, "by May 1st", then you've set your unconscious mind into motion to begin working on the goal. Your goal is probably realistic if you truly *believe* that it can be accomplished. Additional ways to know if your goal is realistic is to determine if you have accomplished anything similar in the past or ask yourself what conditions would have to exist to accomplish this goal.

T can also stand for Tangible – A goal is tangible when you can experience it with one of the senses, that is, taste, touch, smell, sight or hearing.

When your goal is tangible you have a better chance of making it specific and measurable and thus attainable.

Create 1-2 S.M.A.R.T. goals for THIS year: