Welcome Back For Day 2

Question 4: What will I do to help students generate and test hypotheses about new knowledge?

Putting in simpler terms...
- Apply previous learning to problems and/or projects that require decision making and critical thinking.

Organize learning goals into a scale
- Advanced = 4.0 More complex learning goal
- Above and beyond the target goal
- Proficient = 3.0 target learning goal
- At the level identified in the standards
- Progressing = 2.0 simpler learning goals
- Foundational knowledge needed to reach level 3
- Beginning = 1.0 with help the learner can do it

Schools are being challenged to increase the rigor of schooling.
- What does it mean to increase the rigor in schools and individual courses?

Increasing Rigor does not mean students learn on their own or get loaded down with more homework.

Increasing rigor is not about forcing students to take more “academic” classes and eliminating Fine Arts or P.E.

Increasing Rigor Refers To:
- Challenging students to reach for greater levels of understanding and be able to use the knowledge they have learned to problem solve and think critically.
- We will look closer at this later today in Design Question 4.
The world wide reality...

Almost any job that pays more than minimum wage—both blue and white collar—now calls for employees who know how to solve a range of intellectual and technical problems. (p. xxii)

Tony Wagner (2008)

Problem and Project Based Learning

Differences

Problem Based Learning
- Most often single curriculum area
- Can be used to represent level 4 in a scale
- Often done by one or a small group of students
- Completed in usually less than a week.

Project Based Learning
- Most often used in cross-curricular situations
- Usually has a rubric or scale specifically for the project itself
- Often, but not always, done in a group
- Usually completed over time, even a semester

Similarities
- Both are based on problem solving processes, critical thinking, and higher levels of cognition.
- Both challenge students through the application and utilization of knowledge.
- Both are more student driven than teacher driven (Reflective Teacher book pages 134-139)
- Review the sample strategies for these elements

Summary of Research

<table>
<thead>
<tr>
<th>Outcome</th>
<th># of Studies</th>
<th>Average Effect Size</th>
<th>Percentile Gain</th>
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<td>.34</td>
<td>13</td>
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<tr>
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<td>.38-.79</td>
<td>15-29</td>
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<tr>
<td>Activating prior knowledge</td>
<td>74</td>
<td>.52</td>
<td>3</td>
</tr>
<tr>
<td>Cognitive Dissonance</td>
<td>31</td>
<td>.31</td>
<td>19</td>
</tr>
</tbody>
</table>

Begin by Teaching a Problem Solving Process....

Random Partner Discussion

How would you describe the following?
- Problem Based Learning
- Project Based Learning

Problem Solving
1. Identify the goal you are trying to accomplish
2. Describe the barriers or constraints that are preventing you from achieving your goal—that are creating the problem.
3. Identify different solutions for overcoming the barriers or constraints and hypothesize which solution is likely to be the most effective.
4. Try your solution—either in reality or through a simulation.
5. Explain whether your hypothesis was correct. Determine if you want to test another hypothesis, using a different solution.
Another problem solving process
- Clearly state the problem...
- What do we believe? (perception)
- What do we know? (facts)
- What do we want? (desired outcome)
- What do we need to do to get what we want? (action steps)

Types of Problem Based Learning
- Making and Defending Claims
- Solving content related problems
- Conducting short investigations or research projects.

Teach students to make claims based on “grounds”
- Matters of common knowledge
- Expert opinion
- Experimental evidence
- Factual information

Common Knowledge...
Information that is generally acknowledged to be true and accurate.
- During the Civil War, some families and friends fought against each other.

Expert Opinion
A statement from an individual who is recognized as an expert in his or her field.
- An opinion on global warming made by a climatologist with years of field-research experience.

Experimental Evidence
Information generated through professional scientific or student-conducted experiments.
- A report on the migration of whales based on GPS tracking technology experiments.

Factual Information
Idea with a body of evidence to support it.
- Ladybugs help plants by eating common pests. (National Geographic Society)

Give them samples...
- Have students find examples of grounds and categorize them....
- Internet, Television, Magazines, Newspapers

Have students provide “backing”
Additional information to validate the grounds for their perspective.
- Students use information from sources they investigate
- Teachers provide some of the resources
Extend the claims to writing…

- Claim (Thesis Statement)
  - Grounds 1 (Topic Sentence)
    - Backing 1a
    - Backing 1b
  - Grounds 2 (Topic Sentence)
    - Backing 2a
    - Backing 2b

Younger Grades Format:

- New Idea: (Claim)
  - Reason I think it is true: (Grounds)
    - What I found out: (Backing)

Teach claims writing with non-content

- Write a claim about:
  - Best musician
  - Best actor
  - What other categories could you use?
  - What might these look like with very young students?

Samples: Content Related Problems

- Elementary math:
  - Three column addition
  - What if a specific step was left out?
  - Students predict how and why this will affect the outcome
- Middle School PE:
  - Students working with BMI
  - Students asked to make recommendations about different situations regarding BMI
  - Must back up their recommendations with rationale

Secondary example:

- Economics Teacher:
  - Negotiating and forming alliances
  - Wise use of resources
  - Adjusting to market conditions
  - Adjusting to changes in regulations

Grouped students in “companies”

- Each company received a specific packet representing the resources they had.
- All packets contained different “resources” and none were the same.

Description:

- Physics Class
  - Students were asked to use those resources to make their company profitable.
  - Had to predict and adapt to changing market conditions and product regulations.

- Title of Problem: Path of Least Resistance
  - Design the most aerodynamic car body you can design by applying specific physics principles we have studied.
Artifacts for Completion
1. Graphic design accompanied by a written rationale for your design which includes key content vocabulary.
2. Car body constructed in your design from materials provided.
3. Video of test run down wind tunnel track.
4. Written report on the success of your design based on your observations and the test video.

Project Based Learning
- Experimental Inquiry (Primary example)
- Capstone Projects (Secondary example)

Experimental Inquiry
1. Students generate and test a hypothesis based on what they have learned. Occurs in several content areas most often.
2. Students design a research project or experiment to test their hypotheses.
3. Students reflect on the accuracy of their thinking orally and written.

Invention Convention
- Cross curricular project involving Social Studies, English, and Science

Invention Convention
- Students studied famous inventors and how they formed ideas...including how patents were obtained.
- Considered a problem they would like to solve —Were taught a problem solving process
- Researched to determine a possible market
- Created a prototype of their product
- Showcased their invention at the convention for judges from the community

Capstone Projects
- Projects that allow students to apply knowledge and skills in real world settings that peak their interest.
- Provide excellent opportunities to include community members, parents, mentors...build them into the project concept.

Capstone Project Overview
Project Requirements
- Letter of intent
- Senior research paper
- Fieldwork journals
- Mentor in the field of study
Two different approaches:
SRD Class or Graduation Requirement.

Successful Projects
- Demonstration of knowledge about the area a student studied.
- Discussion and reflection of the learning journey.
- Articulation of learning stretch: intellectual and personal growth.
- Physical evidence of application of knowledge.
Question 5: What will I do to engage students?

Random Partner Discussion
- How would you define student engagement?

Student Focus Groups
- What do your best teachers do that really helps you learn?

Process
- Student focus groups meet with us
- We ask them:
  - What do your best teachers do that really helps you learn?
  - Give students time to think about their answers and make notes for discussion.

Student Responses:
- Four clear themes emerged in our discussions.
- We have identified them and included some sample quotes from the students within each theme.

Four Themes:
- Building Relationships
- Showing Enthusiasm
- Using Interactive Activities
- Make Sure We Understand

Building Relationships
- “The teacher takes time to get to know us as individuals.”
- “You can tell on the first day if you are going to like a class because the teacher is interested in the students.”
- “Teachers that let us get to know them a little bit as a person.”

Relationships Continued…
- “My best teachers are funny and make me laugh about the stuff we are learning.”
- “I like it when teachers tell you that something was hard for them.”

Showing Enthusiasm…
- “Teachers who are passionate about what they teach make me want to try and get interested in the subject.”
- “One of my teachers told us: I love this subject—it is my passion and I hope you love it too.”
- “Sometimes I think my best teachers would be here even if they weren’t getting paid.”
Interactive Activities Continued:
- “My best teacher has us close our eyes and imagine, create pictures in our mind.”
- “Use technology to help us visualize what something looks like.”

Make Sure We Understand
- “Use the clicker system to see if we are getting it.” “Poll the class”
- “They make you feel like it is OK to ask a question even if it is something simple.”
- “When we are writing notes my best teacher always tells us to stop and think about what we have written.”

Interactive Activities
- “Let us talk about our thinking with each other and try to figure something out.”
- “Put our desks in circles and have a class discussion about what we are studying.”
- “Use activities where we move around and discuss what we think about the idea we are studying.”

Make Sure We Understand
- “Use the clicker system to see if we are getting it.” “Poll the class”
- “They make you feel like it is OK to ask a question even if it is something simple.”
- “When we are writing notes my best teacher always tells us to stop and think about what we have written.”

Understanding Continued:
- “Make sure we know which parts of information are most important.”
- “Take time to tell us why we made mistakes, they don’t just check it wrong and keep going.”
- “Give us good review questions to help us know what we should study.”

Table Team Discussion
- What key comments or ideas from the student focus groups stand out to you or speak to you personally as an educator?

Something to think about...
- What is the balance of teacher talk to student talk during a typical class period?
- Studies show that teachers talk in a regular classroom between 80% and 90% of the time.
- What effect does this have on engagement?

Effect on Engagement...
Assuming a 50 minute class period
Teacher talk = 40 minutes
Student interaction with content/language = 10 minutes
30 students in class
✓ = 20 seconds (or less) per student

Student Engagement...
- Academic Games (vocab step 6)
- Intensity, enthusiasm, and humor
- Physical movement
- Friendly controversy
- Unusual information

Research on The Use of Games to Improve Student Learning
Marzano Research Lab reports the results of three meta-analyses.
Student growth in classrooms that used games ranged from a 13 percentile gain to an 18 percentile gain.
A Six-Step Process for Teaching Vocabulary

Step 1: Provide a description, explanation, or example of the new term.

Step 2: Ask students to restate the description, explanation, or example in their own words.

Step 3: Ask students to construct a picture, symbol, or graphic representing the term or phrase.

Step 4: Engage students periodically in comparison activities.

Step 5: Periodically ask students to discuss the terms with one another.

Step 6: Involve students periodically in games that allow them to play with terms.

Games = Engagement and Practice

- We are going to play a few vocabulary games.
- I’ll explain them first… then you will work with partners for the game.

Talk a Mile a Minute

- Each team designates a talker (Clue Giver)
- The talker tries to get the team to say each of the words in a list by giving clues about the words.
- The talker is allowed to say anything about the terms while talking but must not use the words themselves or any rhyming words.
- If members of the team are having difficulty with a particular term, the talker skips it and comes back to it later.

Talkers raise your hands when your team gets them all.

Our First Category Is:
Things Associated With Outer Space

Sun
Orbits
Mars
Venus
Saturn
Galaxy
Meteors

Now switch roles…

Next topic is: Math Vocabulary Terms

Math Vocabulary

- Right Angle
- Circumference
- Rhombus
- Parallel
- Improper Fraction
- Square Root
- Decimal

A look at some other games…

Can You Identify…?

- Can be a cooperative game for small teams.
- Allows you to strategically group students
- Works for any subject….
- Nonlinguistic game.
Cutting-edge research
Concrete strategies
Sustainable success

Can You Identify?
- Identify all nonlinguistic representations by supplying the correct term.
- Use individually or as small teams
- Empower student(s) to be the judge!

Topic = Math Terms

Who or What Am I
Great game for reviewing content and engaging students in practice

Who or What Am I?
- Requires that students have a relatively deep understanding of the terms and phrases being used.
- Can be played in any subject.

Try a math example:
- Get a partner and one of you turn your back to the screen.
- I will show a math term on the screen as if it were on a card for you as a student.
- You can only ask yes or no questions.

Numerator

TABOO
This favorite game is a great tool for students to practice vocabulary and summarize. The object is to get someone to say the word using clues that don't use the "taboo" words.

Key Vocabulary Here
Words forbidden to be used as clues listed here.
TABOO Examples

<table>
<thead>
<tr>
<th>Part of speech</th>
<th>Adjective</th>
<th>Adverb</th>
<th>Modify</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>Lines</td>
<td>Map</td>
<td></td>
</tr>
<tr>
<td>Verb</td>
<td>Globe</td>
<td>Parallels</td>
<td></td>
</tr>
<tr>
<td>Prime</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Taboo

- Teachers or students can make cards
- More summarization with student-made cards
- Index cards work well
- Play demonstration game
- Pairs, small groups, entire classroom with two teams
- The more "taboo" words, the more difficult the game

Which One Doesn’t Belong?

1. Provide a list of concepts or terms that are related in a particular way.
2. Have the students in teams or on their own decide which item should not be in the list.
3. Have them identify WHY it should not be in the list.
4. This makes a great Bell Ringer Activity and can be a simple exit ticket activity.

Which one doesn’t belong: Why?

<table>
<thead>
<tr>
<th>Math</th>
<th>History</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centimeter</td>
<td>Australia</td>
</tr>
<tr>
<td>Meter</td>
<td>England</td>
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<tr>
<td>Inch</td>
<td>United States</td>
</tr>
<tr>
<td>Gram</td>
<td>Japan</td>
</tr>
</tbody>
</table>

Positive Teacher Demeanor

- Demonstrating enthusiasm
- Demonstrating intensity
- Timing
- Verbal and nonverbal expressions
- Gestures
- Use of appropriate humor
  - associated with a 40 percentile point gain in instructional effectiveness

How are emotions contagious?

If the frontal lobe is not fully developed, how can we help kids mature and develop critical thinking skills?

Mirror Neurons

Discovered in 1992 by Giacomo Rizzolatti
How are emotions contagious?

- “Mirror Neurons allow us to grasp the minds of others, not through conceptual reasoning, but through direct simulation; by feeling, not thinking” Giacomo Rizzolatti
- When you see a person smile, the mirror neurons responsible for smiling fire in your brain.

Using Humor

- When teachers use humor, students feel better about the content, the teacher, and perhaps even themselves.
- Use of appropriate humor
  - associated with a 40 percentile point gain in instructional effectiveness.

A common teacher reaction…

- “I am really not very funny?”

- Access humor for use in the classroom from a host of other sources…

Table team discussion

- Discuss the concept of mirror neurons and how it relates to classroom practice.
- Do you have specific examples that come to mind?

Use funny headlines and pictures

Students Cook & Serve Grandparents
On Thursday, September 9, German School hosted the first annual Grandparents’ Day. All Grandparents were invited to a school

DAUGHTER QUIT SCHOOL
Must sell 830-606-
Other Examples I Found

- “Give Blood This Month and Help Feed the Needy”
- “Poverty Meeting Attracts Poor Turnout”
- “Miracle Cure Kills Fifth Patient”
- “Americans Watch TV 27 Hours A Day”

Movie Clips and Media

Use short clips for different purposes, subject areas, and grade levels.

2 Examples of practice...

Grade 10 teacher used the following video to emphasize the importance of understanding directions......

Making Fun of Yourself

- A teacher using himself or herself as the subject of humor is appropriate and useful.
- It shows kids you are human...and you actually can make mistakes...

“Amazingly, the part of the brain that processes movement is the same part of the brain that processes learning.

Eric Jensen, Teaching With the Brain in Mind, 2005
Table Team

- Discuss types of movement for learning that could be used for any of the following purposes,...
- Be prepared to give some examples that were discussed at your tables

Movement and Learning

- Movement related to rehearsal
- Movement necessary to further understand the content
- Physical representations
- Movement that facilitates sharing
- Whole-class or whole-school exercise

More about movement and learning...

Friendly Controversy

- When people express opposing views, their interest peaks.

Friendly Controversy Strategies

Three strategies
- The class vote
- The debate model
- The town hall meeting

History teacher quote using debates

- “Kids will study and prepare harder for a debate with their classmates than they will for a written quiz or test. Assessing those debates gives me a clear view of what they understand.”

Friendly Controversy Strategies

- The class vote:
  - Introduce an initial topic and take a vote...
  - Global Warming more man made than nature?
  - Yes or No
  - Have some initial discussion (activate prior knowledge)
  - Reveal facts and examples via instruction
  - Take another vote...
  - Repeat the process as appropriate for the topic

- The debate model:
  1. Students must present evidence for their logic
  2. Teams debate against each other (2x2 or 3x3)
  3. Each team: Opening argument, Cross-examinations, Closing argument
  4. Each team evaluates the whole group performance after the debate
Friendly Controversy Strategies

The Town Hall Meeting:
Purpose: examine multiple perspectives:
1. Assign roles for the meeting (i.e. chairperson, time keeper)
2. Assign viewpoints for students to research and represent
Example: Should a law be enacted to ban cell phone use completely in a vehicle while it is moving?

Solo Thinking
Could you use any of these with content you are teaching currently?
Brainstorm a quick example to share

Presenting Unusual Information
Novelty piques the interest in all of us....
Popular TV shows currently....
Swamp People
Deadliest Catch
Storage Wars
I Almost Got Away With It....

An example of practice
World History Teacher
Preparing to begin WWI unit.
Shows a piece of equipment to classes and asks them to record their private guess about what it is and why it was important to WWI.
Reveals to them several days later it was gas mask for a horse....

Some Sources for Information
www.LiveScience.com-- Videos and information on space, animals health....
www.trivia-library.com-- Trivia on nearly every subject and content area....
www.kidsplanet.org-- Kid-friendly information about animals....
www.math.hmc.edu/funfacts-- Puzzles and math tricks in algebra, geometry, probability and calculus....

A few more.....
www.coolmath4kids.com-- Instructional tips for younger math students and fun math brain benders.
www.aldaily.com-- Articles on art and current events
www.listverse.com-- Interesting topics such as “Top 10 Extraordinary People With Disabilities”