1. Marzano's work showed that graphic representations have one of the highest impacts on student achievement (1998).

2. Teachers tend to favor linguistic form when they work with students (Pitler et al. 2007).

3. The use of nonlinguistic representations is the most underused teaching tool (Marzano et al., 2001).

4. Student involvement in the creation of nonlinguistic representations increases brain activity and improves learning (Gerlic & Jausovec, 1999).
Nonlinguistic Representations Defined—
“...Generating mental pictures to go along with information, as well as creating graphic representations for that image” (Marzano, Pickering, and Pollock, 2001)

Research says:

- **Learners acquire and store knowledge in two ways: linguistically (by hearing or reading) and non-linguistically (through visual images or kinesthetic/physical movement). The more students use both systems of representing knowledge, the better able they are to think about and recall what they have learned** (Marzano et al, 2001).

- **Visual representations help students recognize how related topics connect** (NCTM, 2000).

- **Finding patterns helps students organize their ideas so that they can later recall and apply what they have learned** (Bransford et al, 1999; Lehrer & Chazen, 1998).

- **After brainstorming to generate ideas, students can improve their reading, writing, and thinking skills by using thinking maps to help them organize key concepts in a visual way** (Hyerle, 1996).

- **Using visual representation software in classrooms helps students express their developing understanding of core concepts in the form of visual representations that are readily created and shared. These representations help students generate explanations of the phenomena they are investigating** (Michalchik, V. et. al).
Suggestions for Schools

1. “Take the tour”—It doesn’t take much to enter classrooms, observe, and determine if the educators in your building(s) are applying the use of NR’s (Nonlinguistic Representations). Look for regular, systematic use by teachers that (a) combine the verbal and visual, and (b) provide students opportunities to help create NR’s.

2. Revisit research and share samples—Use summaries of research to explain the benefits of NR’s to staff members. Then, share exceptional examples from varied content areas to combine text, visual materials, and kinesthetic activities.

3. Structured playtime—Like our students, educators also benefit from chances to share ideas and work in teams to develop NR’s. Schedule time for teachers to collaborate and create nonlinguistic representations using programs/drawing tools available at your schools (Microsoft Paint© and Word© are simple to draw with. The “print screen” function on your keyboard can also be used to paste an image from your screen into Powerpoint©. It can then be cropped and saved as a finished product).  

4. Model—Assume the role of a teacher and assign staff to be play the role of students. Then, demonstrate how a teacher can involve students in creation of NR’s when creating study guides or when revisiting key vocabulary and concepts.

5. “On Their Terms”—Encourage teachers to allow students to fulfill the requirements of an assignment in nonlinguistic formats selected by students (and using their own tools) whenever feasible. In such a case, teachers need to help clarify the requirements of the learning task to the student and then work jointly with the learner to establish criteria for evaluation.

How many examples of NR’s can you find in “Science – Antimatter” learning activity demonstrated in the presentation?

a. __________________________________________________________

b. __________________________________________________________

c. __________________________________________________________

d. __________________________________________________________

e. __________________________________________________________
6. Use simulations—Whether web-based or conducted in the classroom, simulations allow students to engage in learning and apply/explore content and skills.

7. Technology tools—Encourage educators to tinker with free technology tools for the creation of nonlinguistic representations such as...
   a. Traditional modeling and digital 3D modeling in Google Earth
   b. Spreadsheet software for data collection and analysis
   c. Picture scavenger hunts using cameras or cell phones
   d. Visual mapping tools and software
   e. Video, animation, podcasting, and music

8. Video and animation—Use research to help educators reexamine the way we use video, animation, and other types of media to improve student learning (see appendix entitled “Using Video and Other Media to Improve Learning”).

9. “…Elementary, my dear teachers”—Challenge staff to continue to utilize tools and methods that are effective, but are usually used primarily for younger students (for example--songs, props, skits).

10. Student creation of content—Work to explore formats that allow students to create nonlinguistic representations that regularly combine linguistic and nonlinguistic representations such as video, animation, stop-motion, claymation, and other forms of multimedia. Student created nonlinguistic representations can/should be a part of (1) assessing daily understanding, (2) evaluating knowledge and skills at the end of unit, and (3) sharing student learning with other classes.
Open up a new word document.

Go to insert, shapes, and draw two circles. Drag them so they overlap. Right click the circle on top, and change the transparency by adjusting the slider to 100%.

To create a “grayed out” background, go to insert picture to find an image you have or copy and paste one from the web. Be sure and copy the full-sized one for the best resolution. Then, resize the image by clicking on it, then grabbing and pulling one of the corners. Right click the image and go to format picture. Go to recolor and pick one the schemes that you like. If it is not quite right, feel free to adjust the brightness or contrast using the slider.

To get rid of the white around an image, left click on a picture, then click on format tab. Click on recolor, and use the set transparent color marker to select the white around your image.

HINT--If ever you can’t get an image to move where you want it, right click and go to text wrapping. Change the image to go in front of text or behind text to make it easy to move.
Every introduction has to have three things...

Every introduction has to have three things...

You have to have a hook or lead to draw the reader in,

And some background on your topic and your theeeeeee------sis.

http://www.youtube.com/watch?v=OBWfmC3gP18
### Using Video and other Media to Improve Learning (appendix)

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support attention and motivation</td>
<td>Example- To start off a video on entrepreneurship, a teacher shows quick video clips of two interesting inventions—Flowrider© and iFLY© before beginning the assignment.</td>
</tr>
<tr>
<td>Add aesthetic appeal (humor)</td>
<td>Example- To help teachers reflect on the increasing difficulty of teaching, a presenter shows a clip from the series I Love Lucy where she struggles to keep up with wrapping chocolates moving on a conveyor belt.</td>
</tr>
<tr>
<td>Representational (illustrate a concept in realistic fashion)</td>
<td>Example- To aid students in visualizing the creation of antimatter, a science class looks at an animation prepared by CERN.</td>
</tr>
<tr>
<td>Mnemonic (provide retrieval cues of information)</td>
<td>Example- A Language Arts teacher wants to introduce the concept of parallel episodes within a narrative, so the class looks for repeated events in Goldilocks and the Three Bears.</td>
</tr>
<tr>
<td>Building background information or generating discussions</td>
<td>Example- In a course on current events, a class views a short demonstration of the virtual world, Second Life before discussing the impact of emerging technologies on society.</td>
</tr>
<tr>
<td>Minimize cognitive load (substitute for text or reinforcement of text)</td>
<td>Example- During a Shakespeare unit for middle school, to help students focus not get lost in the language of Shakespeare, a teacher shows a video clip of Franco Zeffirelli’s Romeo and Juliet and turns on the subtitles.</td>
</tr>
<tr>
<td>Allow students to demonstrate mastery of content</td>
<td>Example- To demonstrate mastery of content, a teacher allows students to create a variety student projects that are shared on a single webpage.</td>
</tr>
</tbody>
</table>

Adapted from R.C. Clark and C. Lyons, San Francisco: Jossey Bass Pfeiffer, by John Wiley and Sons
Antimatter

Before you read...
- Try to get the two “balls” to crash in to each other
- Watch the video clip from *Angels and Demons*

As you read...
- Answer these questions using the text. Hint--each question has a corresponding number to match in the margin of the text.

1. Choose one of the three quotes at the beginning of the text and explain what you think it means. (Analysis)

2. What would make a bomb made out of antimatter so powerful? (Comprehension)

3. What does the word “minute” mean as used in the text? (Context Clues)

4. What is the main reason why we haven’t produced large quantities of antimatter? (Making Inferences)
5. Other than making our antimatter, what is another possible way for getting it...AND...why is this difficult to do? (Comprehension)

6. Reread this paragraph about quantum theory from the book...

   The quantum theory was based on the idea that particles like electrons could be described not as pointlike particles but as a wave of some sort, described by Schrödinger’s celebrated wave equation. (The wave represents the probability of finding the particle at that point.)

   Use the information in the text to **draw** in the missing information in the chart below:

<table>
<thead>
<tr>
<th>Most people tend to think of particles like this:</th>
<th>Quantum theory thinks that particles look like this:</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Particle Sketch" /></td>
<td><img src="image2" alt="Wave Sketch" /></td>
</tr>
</tbody>
</table>
Lifecycle of a butterfly
My BIG Ideas