

Marzano's Nine Top Strategies

**Generating and Testing Hypothesis*

Categories of Instructional Strategies That Affect Student Achievement

Category	Average Effect Size	Percentile Gain
Identifying similarities and differences	1.61	45
Summarizing and note taking	1.00	34
Reinforcing effort and providing recognition	.80	29
Homework and practice	.77	28
Nonlinguistic representation	.75	27
Cooperative learning	.73	27
Setting objectives and providing feedback	.61	23
Generating and testing hypotheses	.61	23
Questions, cues, and advance organizers	.59	22

8 Generating and Testing Hypotheses

- The process of generating and testing hypotheses involves the application of knowledge
- Generating and testing hypotheses is not just for science.
 - This cognitive skill applies to many tasks that can be applicable to many content areas

8 Generating and Testing Hypotheses

- Hypothesis generation and testing through induction and deduction
 - **Deductive** thinking starts with general rule to make a prediction about a future event or action
 - **Inductive** thinking draws new conclusions based on information that is known or new (thus creating a general rule)

Inductive versus Deductive Instructional Approaches

Synthesis of 380 Effect Sizes	Average Effect size	Percentile Gain
Average Effect sizes for <u>Inductive</u> Reasoning	.39	15
Average Effect sizes for <u>Deductive</u> Reasoning	.60	23

Thinking in real life...

Thinking is never purely inductive or deductive...

reasoning is often more messy and nonlinear.



Explain the difference between inductive and deductive reasoning to an elbow partner.

Classroom Practice in Generating and Testing Hypotheses

- **Invention**

- Describe a situation that needs improvement
- Identify specific standards for the invention that would improve it
- Brainstorm ideas and hypothesize what might work
- Begin to draft, sketch, or create the invention
- Develop invention and test hypothesis
- If needed, revise hypothesis until it reaches the standards you have set

Classroom Practice in Generating and Testing Hypotheses

- **Experimental Inquiry: ex. Literature**
 - Students could hypothesize how literary devices have influenced readers or the effects of them in their own writing
 - Observe something of interest
 - Apply specific theories or rules to explain what you have observed
 - Based on explanation, generate a hypothesis to predict if theory was applied to what you observed
 - Set up experiment and test hypothesis
 - Explain results

Classroom Practice in Generating and Testing Hypotheses

- **Decision making**

- Example: Who is the best musical group of the last decade
 - Describe your decision question and the alternatives
 - Identify the multiple criteria to be used and indicate the importance by scale of 1-4
 - Rate alternatives (on a scale of 1-3) to indicate which best meets each element of the criteria
 - Multiply the importance of each criteria and rating scale & then add the products to assign a score for the alternatives
 - Which alternative has highest score
 - Based on the decision should you change importance scores or add / drop any criteria

What is the Best Musical Group of this Century?

Criteria	Beatles	Rolling Stones	Jonas Brothers
4. Number of #1 hits	3	2	1
3. Number of records sold	3	2	1
2. Number of fans	2	3	1
1. Number of concerts	1	3	2
Totals	21	23	11

Which Types of Hypothesis Testing Would Work Best for Your Class

- Systems
- Problem solving
- Historical Investigation
- Invention
- Experimental Inquiry
- Decision Making



Share with an elbow partner which of these will work for your course and why.

Classroom Practice Examples

- 10th grade students asked to generate hypothesis during WWII unit. Teacher first teaches basic facts and issues and asks students to choose one of the following:
- Decision making:
What is your hypothesis as to the best method of ending World War II other than the use of the atomic bomb? Use the decision making framework to test your hypothesis.

Classroom Practice Examples

- 10th grade students asked to generate hypothesis during WWII unit. Teacher first teaches basic fact and issues and asks students to choose one of the following:
- Problem Solving:
If you were president of the USA during WWII, how would you force the unconditional surrender of Japan without using the atomic bomb and yet provide for a secure, post-war world?

Classroom Practice Examples

- 10th grade students asked to generate hypothesis during WWII unit. Teacher first teaches basic fact and issues and asks students to choose one of the following:

- Investigation:

Why did Japan attack Pearl Harbor? Some say President Roosevelt intentionally provoked the Japanese. Others disagree. What is your hypothesis? Collect evidence that confirms your hypothesis.

Explanation Strategies for Student Hypothesis Testing

- Templates for reporting with areas for their explanations
- Sentence stems to help them articulate
- Use audiotapes to explain hypothesis and conclusions
- Rubrics
- Invite audience for students to present hypothesis or conclusions