

Generating and Testing Hypotheses

Involves application of knowledge

Many application in Food Science

- What happens if...
 - More liquid is added
 - More dry ingredients are added
 - Muffins are stirred
 - just until mixed
 - Until batter is lumpy
 - Until batter is smooth and shiny

Deductive thinking

- Using a general rule to make a prediction about future action or event
- The more gluten is manipulated the longer and stronger the gluten strands become.
 - Thus when muffins are stirred until the batter is smooth and shiny, they will become ?

Inductive thinking

- Process of drawing new conclusions based on information we know or are presented with.
- Students must first discover the principle from which the hypothesis is generated.
 - Develop gluten balls
 - Hypothesize what will happen to flour mixtures.

Deductive techniques

- Have much larger effect sizes
- Inductive techniques .48 ES
- Deductive techniques .83 ES
- Inductive strategies need to have well-orchestrated set of experiences so students can infer accurate and appropriate principles.

Deductive is probably better

- Present principles directly
- Ask students to generate hypothesis

Hypothesis and Conclusions

- Preferable to have students explain in writing
 - the principles they are working from
 - the hypothesis generated from the principles
 - Why the hypothesis makes sense.

Scientific Method

- Generating and testing hypothesis
- Other types of tasks can employ hypothesis generating and testing

Systems Analysis

- Purpose of system
- Parts of the system
- Functions of each part

Classroom Practices

- For generating and testing hypothesis
 - Systems analysis
 - Problem Solving
 - Historical Investigation
 - Invention
 - Experimental Inquiry

Systems Analysis

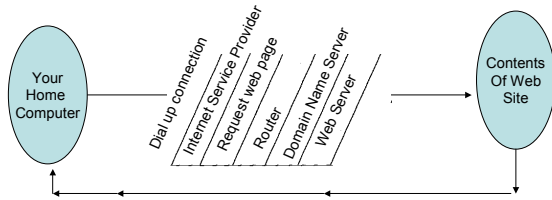
- Family System
 - Explain purpose of system, parts of system, function of each part
 - Describe how parts affect each other
 - Identify a part of the system, describe a change in that part
 - Hypothesize what would happen as a result of this change
 - When possible, test your hypothesis

Other Systems

- Digestive System
- Reproductive System
- Heating and Cooling Systems
- Household Plumbing System
- School System
- Food Transportation System
- Soccer Match
- Aquarium/Terrarium

Systems Analysis Graphic Organizer

- How to access a web site



Systems Analysis Template

- My hypothesis about what will happen
- I think this will happen because
- After I completed the systems analysis, I found
- As a result of doing this task, I learned

Example

- How is the classroom like a system? Define the parts, function of each part, and the purpose
- Write a paragraph that explains how the parts affect one another—how students interaction, how teacher affects students, how an interruption affects the classroom system.
- Imagine a change in the system – i.e. a student assistant will be available
- Make a hypothesis about what will happen as a result of the change
- Describe a possible scenario in which you “test” the hypothesis.

Problem Solving

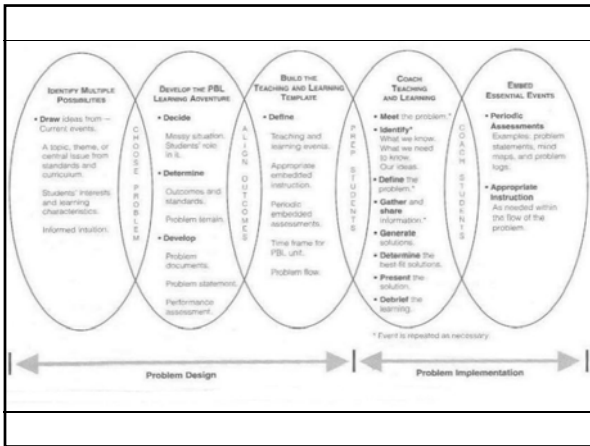
- By definition problems are messy
- They involve obstacles and constraints.

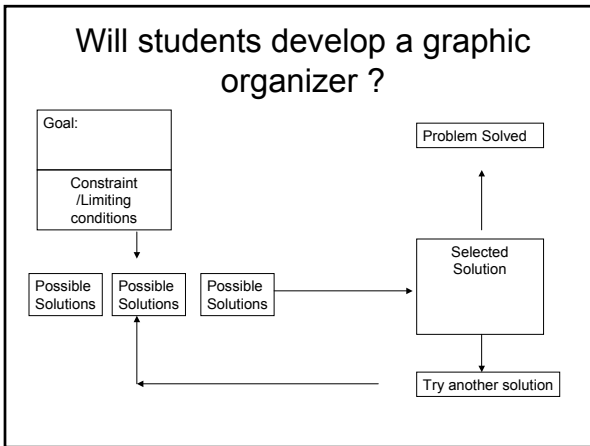
Problem Solving

- Stop the Violence FCCLA Program
- Develop a business plan for establishing after school care for students
- Plan and conduct a "Family Cultures Fair to celebrate and promote diversity in the community
- Research funding and local programs available to low-income families to discover how much money these families have for food each week.
- Create a business offering quick and inexpensive breakfast foods for students

Problem Solving Steps

- Identify the goal to be accomplished
- Describe barriers or constraints that keep you from reaching the goal
- Identify different solutions for overcoming constraints
- Hypothesize which solution will work
- Try your solution
- Explain whether your hypothesis was correct, or try something else.





Problem Solving Results Template

- My hypothesis about the best solution is ...
- I think this idea will work because...
- After I completed the problem-solving process, I found...
- As a result of doing this task, I learned...

Planning Sheet for Problem Solving

- What knowledge will students be learning?
- Do I need to set aside time to teach students the process? How will I teach them the process?
- Will I ask students to use a graphic organizer
- How much guidance should I provide students?
- How will students explain their hypothesis and communicate their conclusions
- How will I monitor how well students are doing with problem solving?
- What will I do to help students who are not problem solving effectively?

Decision Making

- What is the purpose of asking students to make decisions
- What kinds of decision-making activities do I use with my students?
- What questions might students have about this method.

Graphic Organizer for Decision Making

Best Citizen: who best fulfills their personal and civic responsibilities?

Criteria	Kobe Bryant	Bill Clinton	George Bush
Individual Responsibility			
Adheres to moral principles			
Respects rights of others			
Honest			
Respects/upholds the law			
Total			

Graphic Organizer for Decision Making

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What is the most important communication mechanism invented.
Using the decision-making matrix to get started and then add your own criteria

Criteria	Alternatives					
	Telephone	e-mail	telegraph	Wireless phone	fax	Internet chat
# of people affected						
Accessibility						
Cost for basic service						

- What issues arose and you engaged in this decision-making task?
- What insights did you gain about the decision-making process?
- What knowledge would students need to do this task?

Results Template - Decision Making

- My hypothesis about the best solution is ...
- I think this idea will work because...
- After I completed the problem-solving process, I found...
- As a result of doing this task, I learned...

Planning Sheet for Decision Making

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Historical Investigation

- Use when you want students to construct and investigate a plausible scenario for an event from the past about which there is no general agreement.
- Should grow out of confusions or contradictions found in information available about the topic
- Students use available resources to *construct* a resolution to the confusions

Recommendations for classroom practice

- Give students a model for the process
- Use familiar content to teach students the steps for historical investigation
- Give students graphic organizers for the historical investigation
- Guide students as needed
- Ask students to explain their hypotheses and conclusions

Model for Historical Investigation

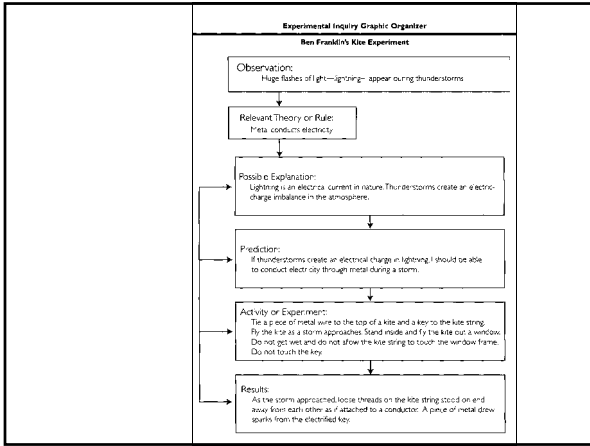
- Clearly describe the historical event
- Identify what is known or agreed upon and what is confusing or contradictory
- Offer a hypotheses
- Seek out and analyze evidence to determine if you hypothetical scenario is plausible

Example Historical Investigation

- “A Child Called It”
 - Clearly describe the historical event
 - Identify what is known/not known/controversial
 - Offer a hypothetical scenario
 - Seek out/analyze evidence to determine if your hypothetical scenario is plausible

George Washington and the Cherry Tree

Concept or Scenario: Did George Washington chop down the cherry tree	
Known or Agreed Upon The story is meant to teach Children a lesson.	:Confusions or Contradictions: Other stories exist, too
Specifics The story about George Washington Chapping down a cherry tree was Published in a book by Mason Locke Weems in 1809. George Washington was a popular figure and many stories were told about him.	Specifics There was a story about his mother's favorite colt dying while George was riding it. George told the truth & did not try to hide the fact that he had been riding the colt
Resolution: The cherry tree story was probably made up. But the important part of the story is what matters. It is meant to teach children to tell the truth.	



Food Science

- Sugar Crystallization
- Varying ingredients
- Petri dishes and contaminants in kitchens, hair, hands, dish clothes, etc.

Tips for helping students generate hypothesis and explanations

- Provide with templates for reporting work
- Provide sentence stems to help articulate explanations
- May audio tapes of students explaining their hypothesis and conclusions, or reinforce writing skills and vocabulary with written work.
- Provide rubrics so students know criteria on which they will be evaluated for their explanations
- Provide external audiences (parents, community members) to ask students to explain their thinking.
