Notes

from

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COMPARING

Comparing is the process of identifying similarities and differences among specific things or ideas. (May also be called: Comparing/Contrasting)

PROCESS GUIDELINES

- Select the items you want to compare and a method of organizing your ideas, e.g. Matrix, Venn, Bubble Graphic.
- Identify the characteristics on which you want to base your comparison of the items.
- Gather and record the relevant information for each characteristic for the items.
- Identify how the items are similar and different with respect to each characteristic.
- Reflect on your work and articulate what you learned, e.g.
  - ✓ What you notice that hadn't occurred to you before,
  - ✓ What surprises and troubles you, or
  - ✓ What is confusing and clear.

THOUGHTFUL APPLICATIONS

- Monitor whether it would be valuable to add, delete, combine, or change any of the characteristics or to include other items.
- Consider whether you need more information before deciding that you can see important similarities and differences for each characteristic.

IMPLEMENTATION NOTES

- Emphasize the use of "language of thinking," e.g. comparing, similarities, differences, characteristics, items, matrix.
- The quality of the characteristics will impact the value of engaging in this process. Changing the characteristics helps learners see totally different traits of the same items.
- The matrix is not the only, but a powerful, format to use K-12.
- If there is a plan to assess and even score their understanding of, and ability to use, the Comparing process itself:
  - ➢ Remember to apply the process to content with which learners are comfortable;
  - ➢ A variation of the scale on the next page might be used.
- When learners are using the Comparing process to analyze content knowledge either for teaching or assessment, the levels of understanding will show up in:
  - ➢ The quality of the characteristics (if learners provide their own);
  - ➢ The detail provided for each characteristics across items;
  - ➢ The analysis of similarities and differences (are they just reported or are conclusions drawn?);
  - ➢ The reflections on what was learned.

COMPARING

COMPARISON MATRIX

	Item 1	Item 2	Item 3	
Characteristic 1				**Similarities and Differences**
Characteristic 2				**Similarities and Differences**
Characteristic 3				**Similarities and Differences**
Characteristic 4				**Similarities and Differences**

COMPARING

SAMPLE TASKS

These sample tasks are offered for general ideas. Before given to learners, the actual tasks would include more detailed directions (deadlines, what must be produced, individual or group formats, etc.), which would greatly vary according to the purpose of the task (Instruction? or Assessment?), the targeted knowledge, learning styles, learners' prior knowledge, etc. The score level of the tasks might vary with different teachers and learners.

SAMPLE TASKS for SCORE 2 (SIMPLE)

TOPIC: Information Literacy
TASK: Identify similarities and differences among four different internet search engines using the characteristics we have discussed.

TOPIC: Maps
TASK: Compare maps and globes.

TOPIC: Cells
TASK: Compare the key structures of plant and animal cells.

SAMPLE TASKS for SCORE 3 (COMPLEX)

TOPIC: Government
TASK: Compare three different forms of government that we have studied. Include in your characteristics the power structure, the role of the people, the main responsibilities. Add your own characteristics to the matrix and identify what you notice from doing this.

TOPIC: Poetry
TASK: Read the two poems, "My Father's Hat" by Mark Irwin and "My Papa's Waltz" by Theodore Roethke. Compare these poems on the literary elements we have been studying: theme, structure, sensory language, and tone.

SAMPLE TASKS for SCORE 4 (BEYOND)

TOPIC: Earth's Atmosphere
TASK: Using what we learned during this Earth's Atmosphere Unit and in the Ocean Unit we finished earlier, compare two journeys. Once starts on the earth's surface and goes deeper and deeper into the ocean. The other starts on the earth's surface and goes higher and higher into space. Include in the characteristics for this comparison: how the temperature, pressure, light, and even emotions would change during the two journeys.

TOPIC: Health: Global Effects of Disease
TASK: Identify two people – either hypothetical or real – who had serious diseases in two different decades or locations. (Example: Typhoid Mary early 1900s and Ryan White with HIV in the 1980s). Compare the effects of the disease on the individual, the family and friends, and the community.

CLASSIFYING

Classifying is the process of grouping items according to similarities.

PROCESS GUIDELINES

- Create a classification system which entails:
  - ✓ Identifying the items that to be classified and the characteristic that will be the focus of the classification;
  - ✓ Creating the categories for that characteristic by specifying the attribute(s) for membership in the category.
- Place items in categories by determining if they fit the attributes for membership in the category.
- If needed, combine categories or split them into smaller categories and specific the new attributes(s).

THOUGHTFUL APPLICATIONS

- Monitor whether it would be valuable to reclassify the items using a different characteristic or set of categories, or to add more items to classify.
- Consider whether this classification is leading to any insights or extended learning; if not, continue to analyze for new groupings.

IMPLEMENTATION NOTES

- Emphasize the use of "language of thinking," e.g. classifying, characteristics, categories, grouping, regrouping
- Learners must be held accountable for defining membership in the categories. Simple games like "which does not belong?" are useful for practicing defining memberships.
- Re-classifying is often the key to helping learners analyze different characteristics of the same items.
- Avoid only using tasks where there is a right-wrong answer to the placement in groups.
- If there is a plan to assess and even score their understanding of, and ability to use, the Classifying process itself:
  - ➢ Remember to apply the process to content with which learners are comfortable;
  - ➢ A variation of the scale on the next page might be used.
- When learners are using the Classifying process to analyze content knowledge either for teaching or assessment, the levels of understanding will show up in:
  - ➢ The quality of the characteristics used to create a classification system (if learners provide their own);
  - ➢ The quality of the explanation of membership into categories;
  - ➢ When applicable, the insight brought to the reclassification of items;
  - ➢ The reflections on what was learned.

CLASSIFICATION MATRIX

Topic:		Characteristic:		
Category Definition	Category Definition	Category Definition	Category Definition	Category Definition

CLASSIFYING

SAMPLE TASKS

These sample tasks are offered for general ideas. Before given to learners, the actual tasks would include more detailed directions (deadlines, what must be produced, individual or group formats, etc.), which would greatly vary according to the purpose of the task (Instruction? or Assessment?), the targeted knowledge, learning styles, learners' prior knowledge, etc. The score level of the tasks might vary with different teachers and learners.

SAMPLE TASKS for SCORE 2 (SIMPLE)

TOPIC: Landforms
TASK: You will be given a list of landforms and bodies of water that we have been studying. Sort them into groups according to a characteristic of your choice that focuses on a concept we have studied. Then reclassify them using a different characteristic.

Basin	Harbor	Plateau	Bay	Highland	Port
Canal	Hill	Prairie	Canyon	Isthmus	Cape
Rain Forest	Lowland	Reservoir	Channel	Marsh	Strait
Delta	Mountain	Stream	Divide	Range	Peak
Swamp	Fjord	Tundra			

TOPIC: Explorers and Exploration
TASK: You will be given the entire list of explorers we have studied. Sort them into groups according to a characteristic of y our choice that focuses on a concept we have studies about explorers and exploration. Then reclassify them using a different characteristic.

SAMPLE TASKS for SCORE 3 (COMPLEX)

TOPIC: Art Appreciation
TASK: You will be given 12 works of art from the 19th century. First, create a classification system based on particular aspects of style and place each piece in the appropriate category. Then create a new classification system based on some aspect of purpose and group the works appropriately.

TOPIC: Scientific Observation
TASK: You will be given a stack of rocks. Using what can be observed, select a characteristic and then classify them into specific groups. Repeat this three times. Be re3ady to explain the "observable" properties that defined your groups.

SAMPLE TASKS for SCORE 4 (BEYOND)

TOPIC: Poetry
TASK: Here are ten short poems. Create a classification system based on some aspect of the structure of the poem. Then select 5 more poems from the classroom resources and place those in the appropriate categories you have created. Repeat this process with a new classification system based on some aspect of figurative language.

TOPIC: World History: Global Conflicts
TASK: Below is a list of wars and other military conflicts we have studied this semester. Create a classification system based on some characteristic of conflicts and describe the categories for that characteristic. Place each of the conflicts listed below and explain why it fits into that category.

ANALOGICAL (ABSTRACT) THINKING

Analogical Thinking is the process of showing how a relationship between two items from one domain can be similar to a relationship in a different domain.

PROCESS GUIDELINES

- Identify the relationship between the two items/ideas from a specific domain.
- Describe that relationship in general terms. Elaborate and refine as needed to establish, in general language, the type of relationship between the items.
- Map that relationship onto a different domain to determine if there is a similar relationship.
- Reflect on your work and articulate what you learned, e.g:
  - ✓ What you noticed that hadn't occurred to you before,
  - ✓ What surprises and troubles you, or
  - ✓ What is confusing and clear.

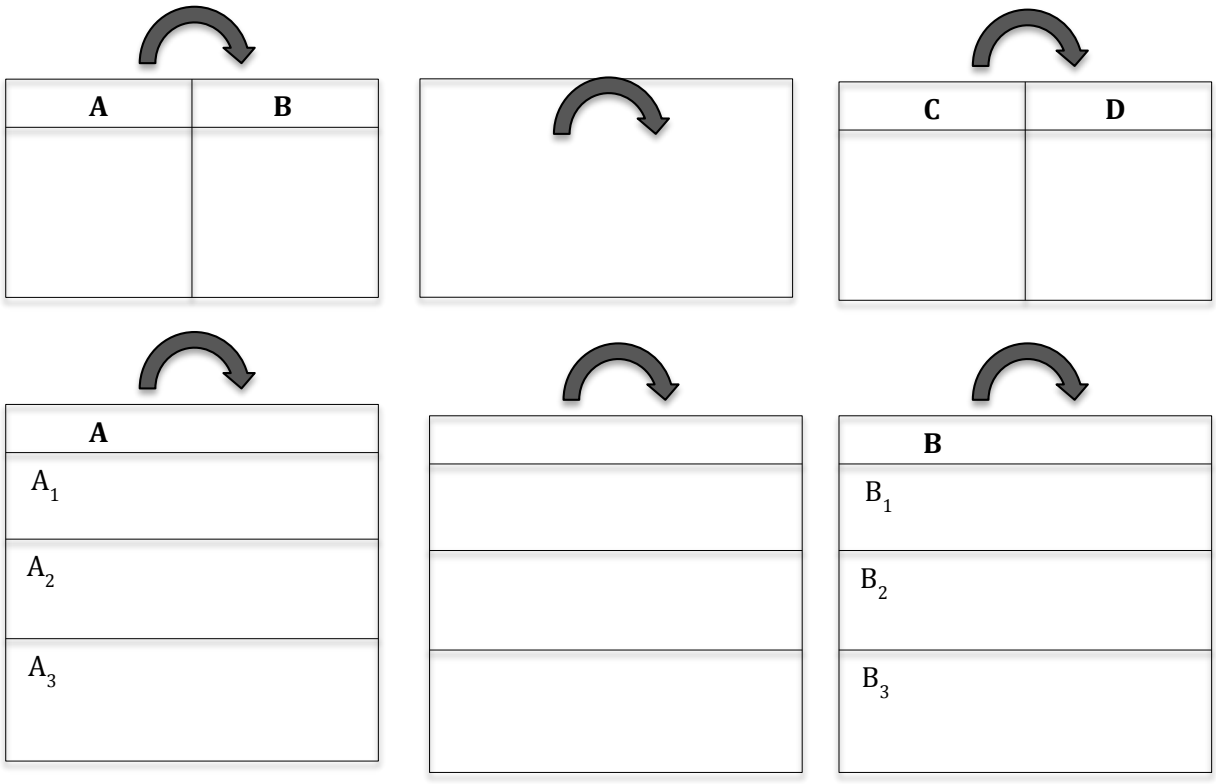
THOUGHTFUL APPLICATIONS

- Keep experimenting with terms that are even more general or specific than the ones chosen initially.
- Continue to apply the new general pattern to increasingly diverse specific information, ideas, or situations and look for more similarities and differences.

IMPLEMENTATION NOTES

- Emphasize the use of "language of thinking," e.g. domains, relationships, analogy.
- When the two domains seem very dissimilar on the surface, the process of generating the general relationships that are similar can lead to significant insights.
- Analogical Thinking can also expose the differences in the two specifics. In other words, it can expose where the analogy breaks down.
- Learners will need experience and feedback to become skilled at determining the most useful way to capture the wording of the relationship.
- If there is a plan to assess and even score their understanding of, and ability to use, the Analogical Thinking process itself:
  - ➢ Remember to apply the process to content with which learners are comfortable;
  - ➢ A variation of the scale on the next page might be used.
- When learners are using the Analogical Thinking process to analyze content knowledge either for teaching or assessment, the levels of understanding will show up in:
  - ➢ The identification of the relationship between specifics of the original domain;
  - ➢ The reflections on what was learned.

ANALOGICAL THINKING (ABSTRACTING) MATRIX



ANALOGICAL (ABSTRACT) THINKING

SAMPLE TASKS

These sample tasks are offered for general ideas. Before given to learners, the actual tasks would include more detailed directions (deadlines, what must be produced, individual or group formats, etc.), which would greatly vary according to the purpose of the task (Instruction? or Assessment?), the targeted knowledge, learning styles, learners' prior knowledge, etc. The score level of the tasks might vary with different teachers and learners.

SAMPLE TASKS for SCORE 2 (SIMPLE)

TOPIC: Algebraic Equations
TASK: Using an Analogical Thinking/Abstracting Matrix, show how equations and sentences are similar and different.

SAMPLE TASKS for SCORE 3 (COMPLEX)

TOPIC: Cell Structures and Functions
TASK: How are the structures and functions of the cell similar to the structures and functions of another system or process?

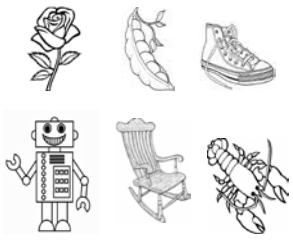
TOPIC: Theme in Literature: The American Dream
TASK: Construct an Analogical Thinking/Abstracting Matrix to show how *The Great Gatsby* was telling the story of the rise and fall of the American Dream.

SAMPLE TASKS for SCORE 4 (BEYOND)

TOPIC: Theme in Literature
TASK: Use the Analogical Thinking/Abstracting Matrix. Select two pieces of literature that seem to tell very different stories but actually exemplify a similar pattern that captures the theme or message.

TOPIC: Photosynthesis
TASK: Using the Analogical Thinking/Abstracting Matrix, show how photosynthesis is similar to making a cake (or a process of your choice). Highlight the similarities and the differences. Explain where and how the analogy breaks down.

TOPIC: Open-ended
TASK: Examine the attached pictures. Create an analogy, using the matrix, showing how the object depicted is similar to a concept, process, event, person, etc. of your choice.



ANALYZING PERSPECTIVES

Analyzing Perspectives is a process of identifying and clarifying the reasons and reasoning underlying multiple perspectives on an issue.

PROCESS GUIDELINES

For a targeted issue or situation about which people react differently:

- Identify multiple perspectives, yours and/or the perspectives of a range of others.
- Explain the reasons and reasoning underlying each perspective.
- Avoiding judgment or rebuttal, continue to analyze in order to accurately represent each perspective. (Note: the same general perspective might have multiple sets of reasons.)
- Reflect on your work and articulate what you learned, e.g.:
  - ✓ What you noticed that hadn't occurred to you before;
  - ✓ What surprises and/or troubles you, or
  - ✓ What is confusing and/or clear.

THOUGHTFUL APPLICATIONS

- Examine your work and determine if it would be valuable to explore more perspectives or analyze more deeply any of the perspectives identified.

IMPLEMENTATION NOTES

- Emphasize the use of "language of thinking," e.g. perspectives, viewpoints, reasoning, issue
- Many states (either with their own standards or with the Common Core) are emphasizing this process of analyzing reasons and reasoning for conflicting perspectives.
- If there is a plan to assess and even score their understanding of, and ability to use, the Analyzing Perspectives process itself:
  - Remember to apply the process to content with which learners are comfortable;
  - A variation of the scale on the next page might be used.
- The Analyzing Perspectives process is most often used for Scores 3 and Scores 4 levels of understanding the content knowledge.
- When learners are using the Analyzing Perspectives process to analyze content knowledge either for teaching or assessment, the levels of understanding will show up in:
  - The identification of multiple perspectives;
  - The explanation of the reasons and reasoning that support that perspectives;
  - The reflections on what was learned.

ANALYZING PERSPECTIVES MATRIX

ISSUE:
Perspective
Reasons/Reasoning
Perspective
Reasons/Reasoning
Perspective
Reasons/Reasoning

ANALYZING PERSPECTIVES

SAMPLE TASKS

These sample tasks are offered for general ideas. Before given to learners, the actual tasks would include more detailed directions (deadlines, what must be produced, individual or group formats, etc.), which would greatly vary according to the purpose of the task (Instruction? or Assessment?), the targeted knowledge, learning styles, learners' prior knowledge, etc. The score level of the tasks might vary with different teachers and learners.

SAMPLE TASKS for SCORE 2 (SIMPLE)

SAMPLE TASKS for SCORE 3 (COMPLEX)

TOPIC: Climate Change: Carbon Footprints
TASK: Examine multiple perspectives on the extent to which humans are creating climate changes. Make sure the perspectives you analyze include those supported with reasons related to carbon pollutants.

TOPIC: Sports: The Culture of Players, Fans, Owners/Managers, Place in Society
TASK: Consider the controversy of "designated hitter" from baseball (or controversy of your choice). Analyze different perspectives on this issue and give reasons for that perspective. Be sure to include reasons that include the roles of fans, players, owners/managers, and place of the sport in society.

SAMPLE TASKS for SCORE 4 (BEYOND)

TOPIC: Graphs and Charts
TASK: Identify an issue about which people have different perspectives and their reasons that support that perspective could are represented in a graph or chart. Then identify a very different perspective and use a different, or variation of the previous graph or chart to support that perspective.

TOPIC: Health: Individual Responsibility vs The Role of Government
TASK: Select an issue related to health about which different people have different perspectives. Using the Analyzing Perspectives Matrix, identify different perspectives and show how conflicting perspectives are influenced by the sometimes conflicting role of individual responsibility and government regulations.

CONSTRUCTING SUPPORT

Constructing Support is the process of constructing a network of support for an assertion.

PROCESS GUIDELINES

- Determine whether the situation warrants taking a position or supporting a point of view.
- When the situation warrants it, clearly state the position or point of view you are supporting.
- Provide reasons to support your position or point of view.
- Support each reason with evidence, e.g. facts, examples, quotes.
- Determine what qualifiers or counter arguments need to be stated and either accepted or refuted.
- Reflect on your work and articulate what you learned, e.g:
    - ✓ What you noticed that hadn't occurred to you before,
    - ✓ What surprises and troubles you, or
    - ✓ What is confusing and clear.

THOUGHTFUL APPLICATIONS

- Monitor the quality of the persuasive techniques to avoid including fallacies or invalid reasoning.
- Assess and, when necessary, amend or modify your arguments until you are confident about the strength of your support.

IMPLEMENTATION NOTES

- Emphasize the use of "language of thinking," e.g. fact, opinion, assertion, argument, appeals, personality, tradition, rhetoric, reason, reasoning, evidence, claim, elaboration, qualifier, (selected) fallacies.
- Many states (either with their own standards or with the Common Core) are emphasizing this process of constructing and tracing strong support for a position.
- Although support that is reasoned and logical is an important focus, learners need to be aware of how to use, and how others use, other types of appeals.
- Learners need experience in both constructing a line of reasoning to support an assertion and tracing the reasoning of others.
- This process if often taught along with the ability to cite valid references for evidence.
- If there is a plan to assess and even score their understanding of, and ability to use, the Constructing Support process itself:
    - ➢ Remember to apply the process to content with which learners are comfortable;
    - ➢ A variation of the scale on the next page might be used.
- The Constructing Support process is most often used for Scores 3 and 4 levels of understanding of the content knowledge.
- When learners are using the Constructing Support process to analyze content knowledge either for teaching or assessment, the levels of understanding will show up in:
    - ➢ The assertion/claim;
    - ➢ The quality of the evidence including the relationship between evidence and claim;
    - ➢ The reflections on what was learned.

CONSTRUCTING SUPPORT MATRIX

Position or Point of View:	
Reason 1	Evidence (data, examples, quotes):
Reason 2	Evidence (data, examples, quotes):
Reason 3	Evidence (data, examples, quotes):
Opposing View/Qualifier	Acceptance/Refutation

CONSTRUCTING SUPPORT

SAMPLE TASKS

These sample tasks are offered for general ideas. Before given to learners, the actual tasks would include more detailed directions (deadlines, what must be produced, individual or group formats, etc.), which would greatly vary according to the purpose of the task (Instruction? or Assessment?), the targeted knowledge, learning styles, learners' prior knowledge, etc. The score level of the tasks might vary with different teachers and learners.

SAMPLE TASKS for SCORE 2 (SIMPLE)

SAMPLE TASKS for SCORE 3 (COMPLEX)

TOPIC: Nutrition and Comprehension
TASK: We have read two stories from The Giant Alexander series. Your job is to decide whether Alexander's eating habits were nutritious or not. Use specific details from the stories to provide evidence of your answer.

TOPIC: Sports: The Culture of Players, Fans, Owners/Managers, Place in Society
TASK: Consider the controversy of "designated hitter" from baseball (or controversy of your choice). Take a position and construct support for that position. Be sure to include reasons and evidence that address the roles of fans, players, owners/managers, and place of the sport in society.

SAMPLE TASKS for SCORE 4 (BEYOND)

TOPIC: Math: Statistics
TASK: Identify an issue about which people take different positions. Take a position on the issue. As you construct support for that position, either find or generate fictitious data that provide evidence for your claims. Then take an opposing position and use the same set of data to provide support for that position.

TOPIC: Media Literacy
TASK: Watch the video on _____. Use the information from the program to take a position and construction support for your position.

ANALYZING ERRORS IN REASONING

Analyzing Errors in Reasoning is the process of recognizing and responding to rhetorical strategies and fallacies.

PROCESS GUIDELINES

- Determine whether the information being presented is important or is intended to influence your beliefs or actions.
- If the information is important or intended to influence you, identify statements or claims that are unusual, violate what you know to be true, or seem wrong.
- Look for errors in the reasoning underlying the statements or claims you have identified. (Faulty Logic? Attacks? Weak References? Misinformation?)
- If you find errors, seek clarification or more accurate information before deciding to accept or reject the statement or claim.
- Reflect on your work and articulate what you learned, e.g:
  - ✓ What you noticed that hadn't occurred to you before,
  - ✓ What surprises and troubles you, or
  - ✓ What is confusing and clear.

THOUGHTFUL APPLICATIONS

- Monitor your own objectivity by insuring that the errors you detect are actually errors in reasoning, not simply claims or statements you disagree with.
- Continue to seek clarification or accurate information so you are confident about accepting or rejecting the claim or statement.

IMPLEMENTATION NOTES

- Emphasize the use of "language of thinking," e.g. reasons, reasoning, errors, fallacies, logic, attacks, misinformation, weak references.
- The initial phase of analyzing errors is to determine if the situation warrants this analysis.
- Reinforce to learners that sometimes they need to trust their "gut feeling" that something is wrong, even when they can't label or pinpoint a particular type of error. It is better to find no error after further analysis that it is to be duped because of not examining information more closely.
- Learning about specific types of errors will improve one's ability to detect and clarify errors in reasoning.
- If there is a plan to assess and even score their understanding of, and ability to use, the Analyzing Errors process itself:
  - ➢ Remember to apply the process to content with which learners are comfortable;
  - ➢ A variation of the scale on the next page might be used.
- The Analyzing Errors process is most often used for Scores 3 and 4 levels of understanding of the content knowledge.
- When learners are using the Analyzing Errors process to analyze content knowledge either for teaching or assessment, the levels of understanding will show up in:
  - ➢ The identification of claims and evidence;
  - ➢ The quality especially of errors in the use of information related to the issue;
  - ➢ The reflections on what was learned.

ANALYZING ERRORS MATRIX

Information/Reasoning:
Error:
What would you say to the source or what additional explanation or information would you request?
Information/Reasoning:
Error:
What would you say to the source or what additional explanation or information would you request?

ANALYZING ERRORS IN REASONING

TYPES OF ERRORS IN THINKING

(Adapted in part from Dimensions of Learning)

The following four sections briefly describe some types of errors in thinking people make as a result of using faulty logic, attacks, weak references, and misinformation.

- **POISONING THE WELL:** Making an attack on the person and hoping that the unfavorable information will bias listeners against the person in question and *hence* that they will reject any claims he might make.

- **FALSE CAUSE:** False cause occurs when someone confuses a temporal (time) order of events with causality or when someone oversimplifies a very complex causal network. For example, if someone concludes that the decision to place a man on the moon was prompted by America's failed attempt to send a satellite into orbit, he is confusing temporal order with causality. This is not to say that temporal order does not play part in causality; it is simple to emphasize that causes of an event usually include more than the events that immediately preceded it. Similarly, if a person acknowledges only one or two causes of the Civil War, he is making the error of false cause because the reasons for the Civil War were numerous and complexly related.

- **BEGGING THE QUESTION (CIRCULARITY):** Begging the question involves making a claim and then arguing for the claim by using statements that are simply the equivalent of the original claim. For example, if you say, "That produce is not very useful," and then back up your assertion by saying, "you can't do anything with it" or "it has no apparent application," your argument is circular. You are backing up one statement with others that mean just about the same thing.

- **EVADING THE ISSUE:** Evading the issue is sidestepping an issue by changing the topic. For example, someone evades the issue if, when asked about his involvement in arms trade to foreign countries, he changes the topic of conversation to the necessity of weapons.

- **ARGUING FROM IGNORANCE:** Arguing that a claim is justified simply because its opposite cannot be proven is called arguing from ignorance. For example, arguing that there is no intelligent life beyond the planet Earth because we cannot prove that extraterrestrial life exists is arguing from ignorance.

- **SLIPPERY SLOPE:** Saying that we allow A to happen, the Z will eventually happen too; therefor A should not happen.

- **APPEALING TO THE PEOPLE:** Appealing to the people is an attempt to justify a claim on the basis of its popularity. Supporting the claim that "staying up late does not affect my schoolwork" by stating that everyone in school stays up late is an example of appealing to the people.

- **CONFUSING THE FACTS:** It is not uncommon for people to use information that seems to be factual but has been distorted or modified and is no longer accurate. This happens when, for example, events are described out of order or when important facts are left out.

ANALYZING ERRORS IN REASONING

SAMPLE TASKS

These sample tasks are offered for general ideas. Before given to learners, the actual tasks would include more detailed directions (deadlines, what must be produced, individual or group formats, etc.), which would greatly vary according to the purpose of the task (Instruction? or Assessment?), the targeted knowledge, learning styles, learners' prior knowledge, etc. The score level of the tasks might vary with different teachers and learners.

SAMPLE TASKS for SCORE 2 (SIMPLE)

SAMPLE TASKS for SCORE 3 (COMPLEX)

TOPIC: Climate Change: Carbon Footprints
TASK: You will be given arguments from both sides of the issue of humans causing climate change. Identify errors in the reasoning as well as any errors in the information presented on both sides.

TOPIC: Sports: The Culture of Players, Fans, Owners/Managers, Place in Society
TASK: You will be given arguments from both sides of the controversy of "designated hitter" from baseball. Examine the arguments on both sides of the issue, looking for errors in the arguments, either in the reasoning or in the information presented.

SAMPLE TASKS for SCORE 4 (BEYOND)

TOPIC: Economics: Flat Tax vs Fair Tax vs Graduated Tax
TASK: Over the next month, look for support offered – either in print or the media – for one of these taxation approaches and examine the reasons for that support. Identify errors in the reasoning as well as any errors in the information presented.

Any current or historical issue can be inserted.

DECISION MAKING

DEFINITION

Decision Making is the process of selecting from among seemingly equal alternatives.

PROCESS GUIDELINES

1. Identify a decision and the alternatives to consider.
2. Identify the criteria that the decision needs to meet and the relative importance of those criteria.
3. Examine the extent to which each alternative meets each criterion.
4. As necessary - based on your reaction to the selected alternative - determine if anything needs further consideration, eg.:
    - ✓ New alternatives;
    - ✓ Different criteria;
    - ✓ Seek more information on how well alternatives match criteria.
    - ✓ Reflect on your work and articulate what you learned, e.g.
5. Identify the alternative that best fits the criteria.
6. Reflect on your work and articulate what you learned, e.g.
    - ✓ What you notice that hadn't occurred to you before,
    - ✓ What surprises and troubles you, or
    - ✓ What is confusing and clear.

GRAPHIC ORGANIZER/MATRIX

ALTERNATIVES →				
CRITERIA				
CRITERIA	Importance Scores			
CRITERIA				
CRITERIA				
TOTALS				

Source Author: Debra Pickering

IMPLEMENTATION NOTES: Setting the Culture

- Whenever discussing any Decision-Making situations in the classroom, whether related to content or to everyday topics, use the precise language of Decision-Making: *decision-making, criteria, alternatives, relative importance.*
- Once you have introduced the process, take advantage of everyday opportunities that come up in the class to make and examine decisions. *Examples:*
  - ✓ *Some of you said you watched the Grammy Awards last night. Give who won best album, what criteria do you think were used by many who voted?*
  - ✓ *Why do you think your parents decided not to get a new dog? How are their criteria different from yours?*
  - ✓ *We're going to take a class field trip. How should we decide where to go?*
- Use fun, lighthearted activities to get learners to use the language and parts of the decision-making process. *Example: Play the game, "Would You Rather . . ." and then ask learners what criteria they used to make their selections. (Many examples of this game can be found on the Internet or you can make up your own.)*

IMPLEMENTATION NOTES: Teaching the Process

- To realize the power of applying this process to academic content, learners must learn the process and be held accountable for using it thoughtfully. Therefore, the teacher must challenge learners with questions like:
  - How did you select the criteria?
  - What supports the ratings you gave for the criteria for each alternative?
  - What if you changed the relative importance of certain criteria?
  - How confident are you about the final selection?
- One of the most challenging parts of the decision-making process is the development of criteria. Leaners often need extensive guidance and feedback to do this effectively.
- When learners are determining how well alternatives meet the stated criteria, they will not only be using the knowledge they are learning, but also they will likely need to do additional research that can enhance the depth of their understanding. Make sure all learners have access to the resources to do this research.
- Learners need to understand that decision-making is not just a linear process of filling out a matrix. The 4th guideline is a reminder that decision-making often requires using your knowledge and intuition to rethink initial ideals – consider new alternatives, change criteria, seek additional information and opinions, etc.
- If there is a plan to assess and even score their understanding of, and ability to use, the Decision Making process itself:
  - Remember to apply the process to content with which learners are comfortable;
  - A variation of the scale on the next page might be used.
- When learners are using the Decision Making process to use content knowledge either for teaching or assessment, the levels of understanding will show up in:
  - The quality of the criteria used (if learners provided their own)
  - The detail provided for each criteria across alternatives;
  - The decision made and the support for it;
  - The reflections on what was learned.

DECISION MAKING (SCORING) MATRIX

ALTERNATIVES →				
CRITERIA		__X__ =	__X__ =	__X__ =
CRITERIA	Importance Scores	__X__ =	__X__ =	__X__ =
CRITERIA		__X__ =	__X__ =	__X__ =
CRITERIA		__X__ =	__X__ =	__X__ =
TOTALS				

To use this graphic for decision-making:

1. Identify the alternatives and criter them at the top of each column. (Include as many columns as you need.)
2. Write the criteria in each of the rows (as many as you need), and assign an importantce score to each criterion (e.g. 0-4).
3. The first number in each cell represents the importance score for that criterion. And so, is the same all across the criterion. The second score is the "quality score," which represents the extent to wchi that alternative meets that criterion(e.g. on another 0-4 scale).
4. Multiply the numbers in each cell and then add the totals for each column. The alternative with the highest score is your selection.

Note: The graphic organizer below follows the same process; however, it allows for making notes in each of the cells to indicate why a quality score was assigned.

DECISION MAKING (ANNOTATED SCORING) MATRIX

ALTERNATIVES →				
CRITERIA		_____ _____ _____ __X__ =	_____ _____ _____ __X__ =	_____ _____ _____ __X__ =
CRITERIA	Importance Scores	_____ _____ _____ __X__ =	_____ _____ _____ __X__ =	_____ _____ _____ __X__ =
CRITERIA		_____ _____ _____ __X__ =	_____ _____ _____ __X__ =	_____ _____ _____ __X__ =
CRITERIA		_____ _____ _____ __X__ =	_____ _____ _____ __X__ =	_____ _____ _____ __X__ =
TOTALS				

DECISION MAKING

ACADEMIC TASKS

Learners can engage in academic tasks that require them to either ***make*** a decision (for a real or hypothetical situation) or ***examine*** a decision made by others (e.g. from history, literature, or current events).

Once learners are comfortable and confident with the Decision-Making process, they can use it to engage in meaningful academic tasks. During planning teachers can:

- design *structured* tasks that provide learners with a decision-making situation, along with specific alternatives and criteria;
- create *semi-structured* tasks that provide some information but ask the learners to add certain aspects of their own;
- hold learners accountable for using the process; however, leave the task very open-ended.

In all three situations, the role of the teacher is to ensure all learners can engage in the decision making process and to provide guidance and feedback, as necessary.

DESIGN QUESTIONS

The following design questions will help you think about whether a Decision-Making task would enhance the learning of a particular topic being studied:

- *Is there an unresolved issue important to the unit of study?*
- *Would it be valuable to determine what has the most or least of something, or what is the best or worst of something?*
- *Is there a decision that could be analyzed using the process?*
- *Is there some sort of controversial issue learners could examine by applying the decision-making process to clarify their own position?*

SAMPLE TOPICS

The following are suggested topics for Decision-Making that might be used in the classroom. These ideas range from simple, quick classroom activities to more complex tasks that could be used as the focus for an entire unit or as a challenging comprehensive assessment. (These are provided to stimulate thinking. Obviously, learners would need further guidance when presented with these tasks, including more detailed directions and criteria for evaluating their work.)

- You are Harry Truman. Decide if you are going to drop the bomb.
- Decide where you would – ideally – want to live. Your criteria must reflect aspects of topography, natural resources, and culture.
- For the _____ century, what was the most influential

  - Invention? - Explorer? Scientific discovery? Book?
- Decide if you support human cloning?
- What criteria did Romeo and Juliet use to decide what to do? Do a matrix for them and include criteria they could have included.
- Select the best:
  - short story - scientist working today in their field - investment that will yield - painting that depicts
- Select an MVP for . . .

SITUATIONAL PROBLEM SOLVING

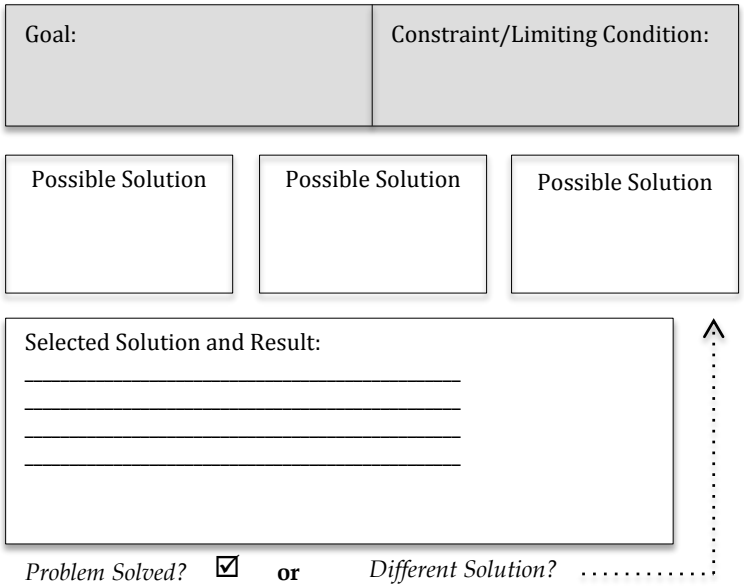
DEFINITION

Situational Problem Solving is the process of seeking solutions for overcoming barriers that are in the way of achieving targeted goals.

PROCESS GUIDELINES

1. Describe a problem situation that includes:
   - ✓ a goal, and;
   - ✓ barriers to achieving that goal, e.g. limiting conditions, lack of materials, resistance.
2. Describe how these barriers are getting in the way of reaching the goal.
3. Identify or create potential solutions to overcoming the barriers.
4. Select the solution that appears to be the most promising and test its effectiveness (e.g. set up experiments, generate hypothetical scenarios, identify information that would clarify the potential effects).
5. As necessary, set up additional tests, keep trying different potential solutions, identify additional solutions, or even redefine the goal.
6. Identify the best solution (s).
7. Reflect on your work and articulate what you learned, e.g.
   - ✓ What you notice that hadn't occurred to you before,
   - ✓ What surprises and troubles you, or
   - ✓ What is confusing and clear.

GRAPHIC ORGANIZER/MATRIX



SITUATIONAL PROBLEM SOLVING

IMPLEMENTATION NOTES: Setting the Culture

- Whenever discussing any Situational Problem-Solving situations in the classroom, whether related to content or to everyday topics, use the precise language of Problem-Solving: *problem solving, problem situation, goal, barriers, limiting conditions, constraints, solutions.*
- Once you have introduced the process, take advantage of everyday opportunities that come up in the class to make and examine decisions. *Examples:*
  - ✓ *Is anyone a fan of the old T series "MacGyver?" **That** is someone who can overcome limiting conditions. Know what I mean?*
  - ✓ *Well, the bond election failed last night. Anyone have any ideas what the school could do to improve the playground – and it can't cost any money?*
  - ✓ *Tell me more about that video game. What are some of the barriers you encounter when trying to achieve the goals? And tell me how you overcome those barriers.*

IMPLEMENTATION NOTES: Teaching the Process

- To realize the power of applying this process to academic content, learners must learn the process and be held accountable for using it thoughtfully. Therefore, the teacher must challenge learners with questions like:
  - ➢ What else can you say about the urgency of the need you are trying to fulfill?
  - ➢ How did you come up with those standards?
  - ➢ Could you actually make the model, not just outline the details?
  - ➢ How confident are you about the final product?
- Monitors learners to ensure they are identifying clear standards for the invention. They are often comfortable identifying "the need" they are trying to fulfill. However, they are less accustomed to setting clear standards before brainstorming ideas for the invention. For example, they come up with a nifty invention to fulfill the need, but it would be too expensive or too big, or require materials not available.
- Sometimes learners are impulsive and will want to go with the first idea that pops into their heads. Provide feedback and encouragement so that they will brainstorm a number of ideas before jumping into drafting, testing, and revising.
- Since invention tasks are challenging and complex, learners need to understand that Invention is not a linear process of sequential steps. Emphasize the 6th guideline as a reminder to learners that Invention often requires using the knowledge and creativity to rethinking initial ideas – to go back and brainstorm new ideas, to continue revising to meet standards, to set new standards, etc.
- If there is a plan to assess and even score their understanding of, and ability to use, the Invention process itself:
  - ➢ Remember to apply the process to content with which learners are comfortable;
  - ➢ A variation of the scale on the next page might be used.
- When learners are using the Invention process to use content knowledge either for teaching or assessment, the levels of understanding will show up in:
  - ➢ The quality of the need that is identified;
  - ➢ The clarity of the standards for the need – before brainstorming ideas;
  - ➢ The effectiveness of the process of drafting, testing and revising the product/idea;
  - ➢ The reflections on what was learned.

SITUATIONAL PROBLEM SOLVING

ACADEMIC TASKS

Learners can engage in academic tasks that require them to either ***solve*** a problem (for a real or hypothetical situation) or ***examine*** a problem-solving situation involving others (e.g. from history, literature, or current events). It is fairly common for teachers to create problem situations by placing hypothetical barriers to achieving a particular goal. (See examples of this below.)

Once learners are comfortable and confident with the Situational Problem-Solving process, they can use it to engage in meaningful academic tasks. During planning teachers can:

- design *structured* tasks that provide learners with a problem situation that includes a specific goal and descriptions of the barrier(s).
- create *semi-structured* tasks that provide some parts of the problem situation, but requires learners to add certain aspects of their own;
- hold learners accountable for using the process; however, leave the task very open-ended.

In all three situations, the role of the teacher is to ensure all learners can engage in the decision making process and to provide guidance and feedback, as necessary.

DESIGN QUESTIONS

The following design questions will help you think about whether a Situational Problem-Solving task would enhance the learning of a particular topic being studied:

- *Is there a situation in which a goal has not been achieved because of some barrier that needs to be overcome?*
- *Would it be valuable to place a hypothetical barrier in a problem situation?*
- *Is there a problem situation for which a solution has been created that could be examined using this Situational Problem-Solving process?*

SAMPLE TOPICS

The following are suggested topics for Situational Problem-Solving that might be used in the classroom. These ideas range from simple, quick classroom activities to more complex tasks that could be used as the focus for an entire unit or as a challenging comprehensive assessment. (These are provided to stimulate thinking. Obviously, learners would need further guidance when presented with these tasks, including more detailed directions and criteria for evaluating their work.)

- Write a rave review of a book or movie – use no superlatives.
- Draw a picture of a park or a city – use no circles.
- Design the set for our play – use only lighting.
- Plan a menu for a dinner that works for the following guests: one with a wheat allergy, a vegan, one with diabetes, and one who is on a low-fat diet.
- Using only a barometer, determine the height of a building.
- Using only balloons and masking tape, make the tallest free-standing tower that you can.
- Using only _____, make a _____.
- Use the Situational Problem Solving process to represent and evaluate the problem solving of:
    - Romeo and Juliet
    - Those responsible for the government shutdown
    - Rapunzel
    - McDonald's, when facing criticism for unhealthy food

INVENTION

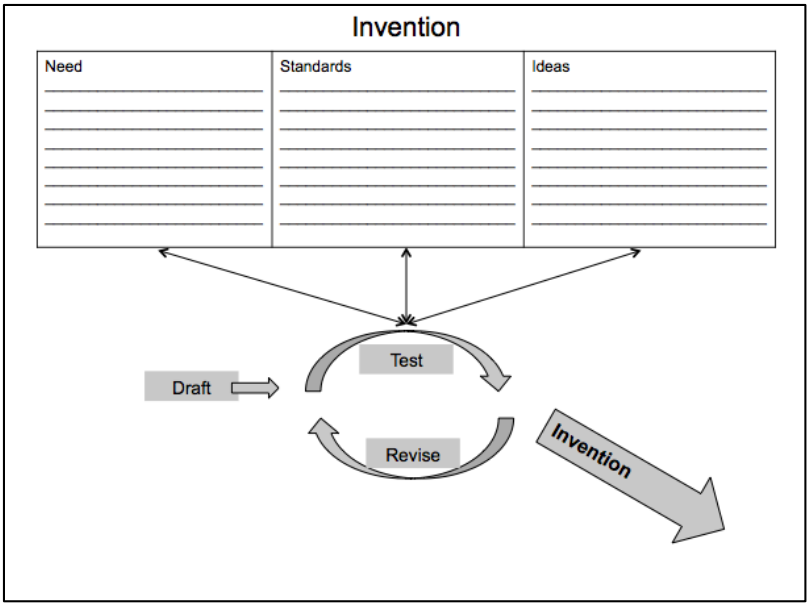
DEFINITION

Invention Reasoning is the process of developing new ideas for products, processes, or methods that fulfill a perceived need.

PROCESS GUIDELINES

1. Identify a need to which you want to respond, e.g., a situation to improve, a task that could be made easier, a dangerous situation to be addressed.
2. Identify specific standards for the invention. Ask, for example: What should it do? What should it not do?
3. Brainstorm ideas to address the need.
4. Drafting: For the most promising idea(s), create a first draft of the invention (e.g. make a model, draw or sketch a picture, create a detailed outline);
5. Testing and Revising: Engage in a process of testing and revising to ensure the invention is fulfilling the need and meeting the standards.
6. As necessary, revisit or clarify the identified need, revise the standards, and generate new ideas to take through the phases of drafting, testing, and revising.
7. Identify the best invention.
8. Reflect on your work and articulate what you learned, e.g:
   - ✓ What you noticed that hadn't occurred to you before,
   - ✓ What surprises and troubles you, or
   - ✓ What is confusing and clear.

GRAPHIC ORGANIZER/MATRIX



INVENTION

IMPLEMENTATION NOTES: Setting the Culture

- Whenever discussing Invention in the classroom, whether related to content or to everyday topics, use the precise language of Invention: *invention, perceived need, draft-test-revise, and standards*.
- Once you have introduced the process, take advantage of everyday opportunities that come up in the class to make and examine problems. *Examples:*
  - *Do you ever see some new device and say to yourself, "I had that idea a long time ago?" What do those inventors do that most people with good ideas don't do?*
  - *The other day I saw this simple, little hair-braiding thingamajig. THEN I heard how much money the inventor made. Why was that invention so successful?*
  - *Don't just tell me you don't like the school schedule. Come up with a new way to do this. What do you need to do first?*
- Use fun, lighthearted activities to get learners to use the language and parts of the Invention process. For example, there are multiple websites that show clever, funny, even weird inventions that learners could evaluate by asking, "What part of the invention process was done well, or poorly?"

IMPLEMENTATION NOTES: Teaching the Process

- To realize the power of applying this process to academic content, learners must learn the process and be held accountable for using it thoughtfully. Therefore, the teacher must challenge learners with questions like:
  - But what is the barrier and how is it preventing the achievement of the goal?
  - How many solutions have you considered?
  - What about redefining the goal?
  - How confident are you about the final selection?
- Before applying these Situation Problem-Solving process guidelines, it is important to determine if, in fact, there is a problem situation, as defined here. Notice that the 1st guideline states that a situational problem includes a goal ***and a barrier***; just having a challenging goal does not mean there is a problem situation for which these particular process guidelines would apply.
- Learners may need extensive encouragement and feedback to identify or create solutions to complex problems. If it would be very difficult – if not impossible – to test solutions to a problem situation, learners may need modeling and guidance to figure out other ways to determine the effectiveness of potential solutions.
- The 5th guideline is a reminder that problem solving is not a tidy linear process. It often requires using the knowledge and creativity to rethink initial ideas, consider new solutions, test and retest, or even redefine the goal.
- If there is a plan to assess and even score their understanding of, and ability to use, the Situational Problem Solving process itself:
  - Remember to apply the process to content with which learners are comfortable;
  - A variation of the scale on the next page might be used.
- When learners are using the Situational Problem Solving process to use content knowledge either for teaching or assessment, the levels of understanding will show up in:
  - The clarity of the goal and identified barrier(s);
  - The quality of the testing and adjusting potential solutions;
  - The solution chosen and the support for it;
  - The reflections on what was learned.

INVENTION

ACADEMIC TASKS

Learners can engage in academic tasks that require them to either ***invent*** something (for a real or hypothetical situation) or ***examine*** a the invention of others (e.g. from history, literature, or current events). It is fairly common for teachers to create problem situations by placing hypothetical barriers to achieving a particular goal. (See examples of this below.)

Once learners are comfortable and confident with the Invention process, they can use it to engage in meaningful academic tasks. During planning teachers can:

- design *structured* tasks that provide learners with, for example, a specific need, certain standards, and even some initial ideas;
- create *semi-structured* tasks that provide some information, but ask the learners to add certain aspects of their own;
- hold learners accountable for using the process; however, leave the task very open-ended.

In all three situations, the role of the teacher is to ensure all learners can engage in the decision making process and to provide guidance and feedback, as necessary.

DESIGN QUESTIONS

The following design questions will help you think about whether an Invention task would enhance the learning of a particular topic being studied:

- *Is there something that could be improved with a new idea?*
- *Is there an unmet need that, if fulfilled, would change a situation?*
- *Could the invention process be used to examine how something new was created?*

SAMPLE TOPICS

The following are suggested topics for Invention that might be used in the classroom. These ideas range from simple, quick classroom activities to more complex tasks that could be used as the focus for an entire unit or as a challenging comprehensive assessment. (These are provided to stimulate thinking. Obviously, learners would need further guidance when presented with these tasks, including more detailed directions and criteria for evaluating their work.)

- Write a new law that would . . .
- Using what you have learned about aerodynamics, create a new paper airplane.
- Create a football play that would . . .
- As we study the Westward Movement in U.S. History, come up with an invention that would have helped the pioneers.
- Select an inventor and identify how well each phase of the Invention process is exemplified in that inventor's work.

EXPERIMENTAL INQUIRY

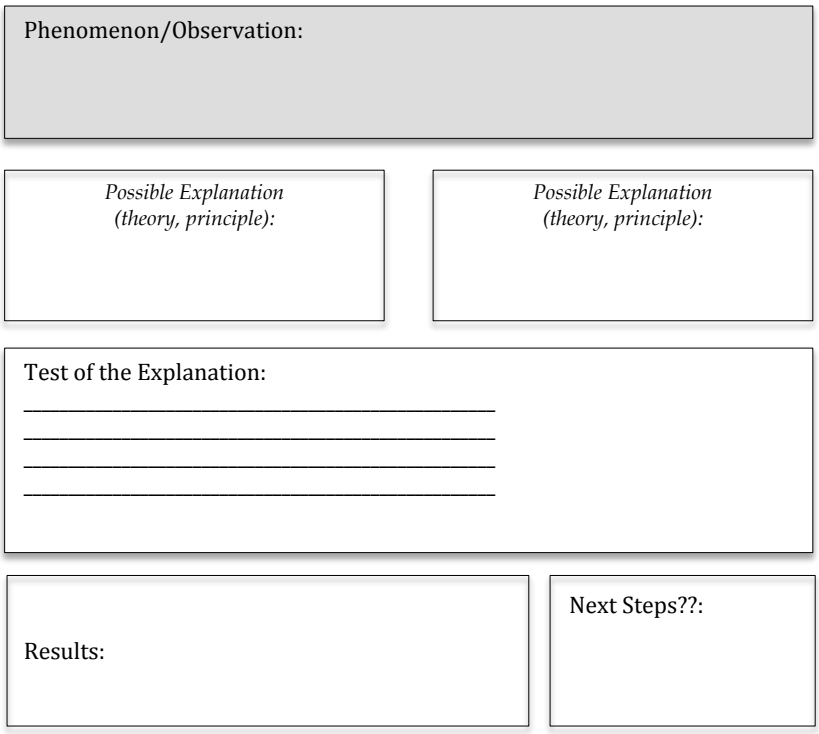
DEFINITION

Experimental Inquiry is a process of generating and testing explanations of phenomena or events.

PROCESS GUIDELINES

1. Describe a phenomenon or event that you are trying to understand.
2. Identify potential explanation(s) for the phenomenon or event, e.g., principles, generalizations, or rules.
3. For the most probable explanation, set up experiments or activities to test how well it explains the phenomenon or event. For each experiment or activity, predict the outcome that is likely if the holds up.
4. Describe the result of your experiment and offer conclusions about the strength of your explanation.
5. As necessary, revise your explanation(s), conduct more experiments, or re-examine results.
6. Identify the best explanation for the phenomenon or event.
7. Reflect on your work and articulate what you learned, e.g.:
   - ✓ What you noticed that hadn't occurred to you before;
   - ✓ What surprises and/or troubles you, or
   - ✓ What is confusing and/or clear.

GRAPHIC ORGANIZER/MATRIX



EXPERIMENTAL INQUIRY

IMPLEMENTATION NOTES: Setting the Culture

- Whenever discussing Experimental Inquiry in the classroom, whether related to content or to everyday topics, use the precise language of Experimental Inquiry: *experimental, inquiry, phenomenon, hypothesis, theory, rule.*
- Once you have introduced the process, take advantage of everyday opportunities that come up in the class to engage in or examine examples of Experimental Inquiry. *Examples:*
  - *Okay. No one did very well on this test. My hypothesis was that you didn't study, but after doing a little digging, I've concluded that is not true. You have to help me figure this out.*
  - *During the past election, someone must have hypothesized that people don't vote if they don't feel a close connection to the candidates. So, phones range off the hook and TV ads were designed to get closer to more voters. How do you think the hypotheses held up? Did it work?*
  - *Why do kids bully others? Let's see if we can figure this out and try to fix it.*
- Use fun, lighthearted activities to get learners to use the language and parts of the Experimental Inquiry process. For example, go to websites that encourage curiosity, like HowStuffWorks.com, and use the language of inquiry to discuss what you see. Encourage learners to brainstorm what ***they*** wonder about, what intrigues them, and what confuses them in the world.

IMPLEMENTATION NOTES: Teaching the Process

- Experimental Inquiry can be taught as a much more complex process than what is the focus here. Especially in science classes, some teachers will want to go deeper and include instruction on things like dependent and independent variables, control groups, detailed data analysis, etc. However, the looser but powerful generic process offered here can be used effectively across many age levels and disciplines.
- To realize the power of applying this process to academic content, learners must learn the process and be held accountable for using it thoughtfully. Therefore, the teacher must challenge learners with questions like:
  - What explanations have you considered?
  - Have you done enough testing of that explanation?
  - Is it time to try a different explanation?
  - How confident are you about the explanation you have tested?
- One of the flexible aspects of these particular Experimental Inquiry guidelines is the notion of doing an "activity" instead of an actual experiment. Learners might need modeling and examples to understand that activities, such as surveys, interviews, or further information gathering, are not strictly speaking, experiments, but can provide insight into the strength of the explanation they are considering.
- Since Experimental Inquiry tasks are challenging and complex, learners need to understand that Experimental Inquiry is not a linear process of sequential steps. Emphasize the 5th guideline as a reminder to learners that Experimental Inquiry often requires using the knowledge and perseverance to rethink initial ideas.
- If there is a plan to assess and even score their understanding of, and ability to use, the Experimental Inquiry process itself:
  - Remember to apply the process to content with which learners are comfortable;
  - A variation of the scale on the next page might be used.
- When learners are using the Experimental Inquiry process to use content knowledge either for teaching or assessment, the levels of understanding will show up in:
  - The identification of the most plausible explanation for a phenomenon or event.
  - The degree to which their experiments give strength to their explanation.
  - The reflections on what was learned.

EXPERIMENTAL INQUIRY

ACADEMIC TASKS

Learners can engage in academic tasks that require them to either ***engage in*** Experimental Inquiry or ***examine*** the Experimental Inquiry of others (e.g. from history, literature, or current events).

Once learners are comfortable and confident with the Experimental Inquiry process, they can use it to engage in meaningful academic tasks. During planning teachers can:

- design *structured* tasks that provide learners with a phenomenon or event that needs explain, and even with possible explanations, or
- create *semi-structured* tasks that provide some information, but ask the learners to add certain aspects of their own;
- hold learners accountable for using the process; however, leave the task very open-ended.

In all three situations, the role of the teacher is to ensure all learners can engage in the decision making process and to provide guidance and feedback, as necessary.

DESIGN QUESTIONS

The following design questions will help you think about whether an Experimental Inquiry task would enhance the learning of a particular topic being studied:

- *Is there a phenomenon for which an explanation could be offered and tested?*
- *Is there a phenomenon or event that has been explained that could be examined using the Experimental Inquiry process?*

SAMPLE TOPICS

The following are suggested topics for Experimental Inquiry that might be used in the classroom. These ideas range from simple, quick classroom activities to more complex tasks that could be used as the focus for an entire unit or as a challenging comprehensive assessment. (These are provided to stimulate thinking. Obviously, learners would need further guidance when presented with these tasks, including more detailed directions and criteria for evaluating their work.)

- Try to explain why a hanging shower curtain moves in toward the water when the shower is turned on.
- Why do people . . .

INVESTIGATION

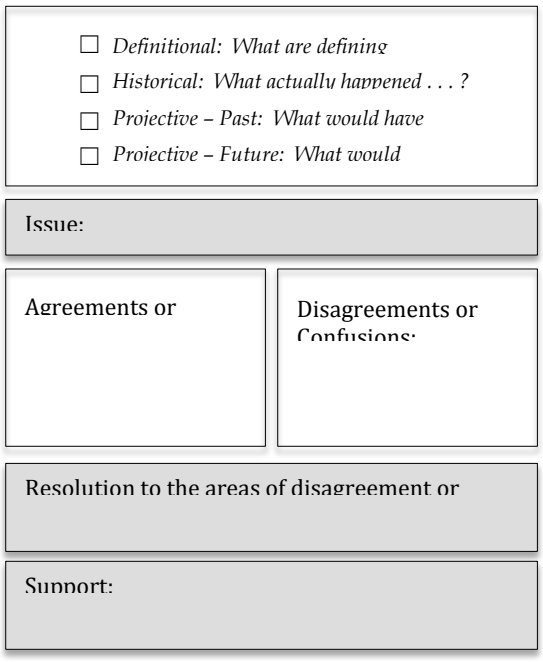
DEFINITION

Investigation is the process of identifying concepts or events about which there are confusions or contradictions and offering plausible resolutions.

PROCESS GUIDELINES

1. Identify a concept or event about which credible sources disagree, or for which there seems to be confusion:
   - ✓ Definitional Investigation: defining a concept;
   - ✓ Historical Investigation: constructing a scenario for a past event;
   - ✓ Projective Investigation: constructing a scenario for a hypothetical past or future event.
2. For the concept or event, describe:
   - ✓ The areas of agreement or clarity;
   - ✓ The areas of disagreement or confusion.
3. Develop a plausible resolution (definition or scenario) to the contradiction or confusion, and build support with credible reasons or logic.
4. As necessary, further clarify the confusions or contradictions. Examine the resolution to ensure that it is plausible and is supported with valid logic and reasons.
5. Present and defend the resolution.
6. Reflect on your work and articulate what you learned, e.g.:
   - ✓ What you noticed that hadn't occurred to you before;
   - ✓ What surprises and/or troubles you, or
   - ✓ What is confusing and/or clear.

GRAPHIC ORGANIZER/MATRIX



Source Author: Debra Pickering

INVESTIGATION

IMPLEMENTATION NOTES: Setting the Culture

- Whenever discussing Investigation in the classroom, whether related to content or to everyday topics, use the precise language of Invention: *investigation, contradiction, plausible resolution.*
- Once you have introduced the process, take advantage of everyday opportunities that come up in the class to engage in or examine examples of Investigation. *Examples:*
  - *What I realize is we all – in this class – don't really agree on the definition of plagiarism. Yes, there is general agreement, but there are some parts of the definition about which we disagree. Let's figure this out together.*
  - *Has anybody seen the movie, Lincoln? I kept wondering, "How do they know what happened? So much of it was not written down, and nobody was there." Does that bother anybody else?*
- Use fun, lighthearted activities to get learners to use the language and parts of the Investigation process. For example, highlight the Investigation process of the detective or courtroom TV shows. Prompt learners to watch for examples that they think were either "right on" and plausible or "way off" and implausible.

IMPLEMENTATION NOTES: Teaching the Process

- Investigation is very closely related to Experimental Inquiry in that they both are processes to clarify. However, Experimental Inquiry focuses on ***the application of*** a general principle or generalization to explain the "why?" and "how?" of something. Whereas Investigation requires ***the generating something*** to answer "what?" and "what happened or will happen?"
- Learners engaged in research on a topic to clarify their own understanding is not an example of Investigation as defined here. While that is a worthwhile endeavor, the Investigation process offered here addresses the presence of confusions and contradictions *among credible sources*.
- To realize the power of applying this process to academic content, learners must learn the process and be held accountable for using it thoughtfully. Therefore, the teacher must challenge learners with questions like:
  - In what sources did you see confusions or contradictions?
  - Were those really just different opinions?
  - I like the projections you made but what makes those plausible, not just interesting?
  - Do you have enough support?
- Since Investigation tasks are challenging and complex, learners need to understand that Investigation is not a linear process of sequential steps. Emphasize the 4th guideline as a reminder to learners that Investigation often requires using the knowledge and perseverance to rethink initial ideas.
- If there is a plan to assess and even score their understanding of, and ability to use, the Situational Problem Solving process itself:
  - Remember to apply the process to content with which learners are comfortable;
  - A variation of the scale on the next page might be used.
- When learners are using the Investigation process to use content knowledge either for teaching or assessment, the levels of understanding will show up in:
  - The identification of concept or event (past or future) about which there are contradictions or confusions among credible sources;
  - The degree to which the proposed resolution is logical and plausible.
  - The reflections on what was learned.

INVESTIGATION

ACADEMIC TASKS

Learners can engage in academic tasks that require them to either ***engage*** in investigation or ***examine*** the Investigation of others (e.g. from history, literature, or current events).

Once learners are comfortable and confident with the Investigation process, they can use it to engage in meaningful academic tasks. During planning teachers can:

- design *structured* tasks that provide learners with a concept or event to investigate and explain the areas of disagreement or confusion.
- create *semi-structured* tasks that provide some information, but ask the learners to add certain aspects of their own;
- hold learners accountable for using the process; however, leave the task very open-ended.

In all three situations, the role of the teacher is to ensure all learners can engage in the decision making process and to provide guidance and feedback, as necessary.

DESIGN QUESTIONS

The following design questions will help you think about whether an Investigation task would enhance the learning of a particular topic being studied:

- *Is there a concept about which there is confusion or contradiction among credible sources?*
- *Is there a past event or scenario about which there is confusion or contradiction among credible sources?*
- *Is there a hypothetical past or future scenario that could be constructed?*
- *Is there an investigation or a concept or an event that could be analyzed?*

SAMPLE TOPICS

The following are suggested topics for Investigation that might be used in the classroom. These ideas range from simple, quick classroom activities to more complex tasks that could be used as the focus for an entire unit or as a challenging comprehensive assessment. (These are provided to stimulate thinking. Obviously, learners would need further guidance when presented with these tasks, including more detailed directions and criteria for evaluating their work.)

- What would be different today if the United States had been discovered and developed from the west coast to the east coast?
- What is the definition of "Third World?" Make clear distinctions about how countries are so categorized.
- What is collaboration in the classroom and how is it distinct from "cheating."
- What did Shakespeare write?
- What happened the night of Paul Revere's ride?
- Is a virus a living thing?
- What would happen if we did human cloning?

SYSTEMS ANALYSIS

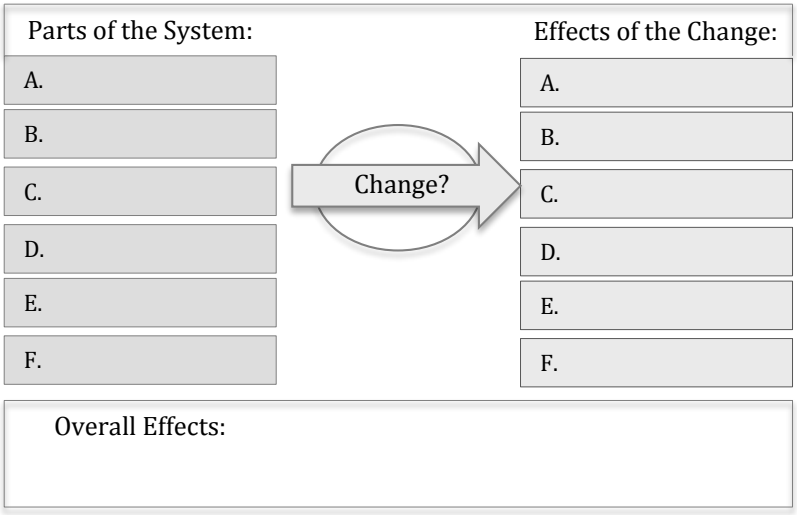
DEFINITION

Systems Analysis is a process of defining the parts of a system and describing the manner and extent of the interaction of those parts.

PROCESS GUIDELINES

1. Explain the purpose of the system, the parts of the system and the function of each part.
2. Describe how the parts affect each other.
3. Identify a part of the system, describe a change in that part, and then hypothesize what would happen as a result of the change.
4. Seek support for your hypothesis by, for example:
   - ✓ Actually changing the part;
   - ✓ Creating a model or a simulation to change the part;
   - ✓ Identifying evidence or credible sources that support your hypothesis.
5. As necessary, continue to test the effects of the change, redefine or elaborate on the descriptions of the parts and their interactions, and try a different change in the system.
6. Present your conclusions about the effect of changing the system.
7. Reflect on your work and articulate what you learned, e.g.:
   - ✓ What you noticed that hadn't occurred to you before;
   - ✓ What surprises and/or troubles you, or
   - ✓ What is confusing and/or clear.

SYSTEMS ANALYSIS GRAPHIC



SYSTEMS ANALYSIS

IMPLEMENTATION NOTES: Setting the Culture

- Whenever discussing Systems Analysis in the classroom, whether related to content or to everyday topics, use the precise language of Systems Analysis: *system, interaction, interdependent*
- Once you have introduced the process, take advantage of everyday opportunities that come up in the class to engage in or examine examples of Systems Analysis. *Examples:*
  - *I hear your complaints about tests. But, what if schools no longer gave tests. How would school systems change? What might be good and what might be bad?*
  - *It stinks how badly our team lost yesterday. How can missing just one player change the whole team like that?*
- Use fun, lighthearted activities to get learners to use the language and parts of the Systems Analysis process. For example, have learners play a simple card game, like Go Fish, and then ask them to change (add, delete, or alter) just one rule. Let them describe how other parts of the game are changed and whether that is a bad or good thing. Do similar activities with sports or video games.

IMPLEMENTATION NOTES: Teaching the Process

- When learners are defining the purpose and parts of a system, they may need help in defining the boundaries of what they are analyzing. Many systems, such as school systems, government systems, etc., are so extensive and contain systems within systems; it would be impossible to analyze very single part.
- To realize the power of applying this process to academic content, learners must learn the process and be held accountable for using it thoughtfully. Therefore, the teacher must challenge learners with questions like:
  - What aspects of the system are you most interested in?
  - Do you need to go back and identify other parts of the system you missed?
  - How confident are you of this effect of the change in the system?
- Since Systems Analysis tasks are challenging and complex, learners need to understand that Systems Analysis is not a linear process of sequential steps. Emphasize the 5th guideline as a reminder to learners that Systems Analysis often requires using the knowledge and perseverance to rethink initial ideas.
- Many learners will benefit by using some sort of graphic like that shown here.

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ACADEMIC TASKS

Learners can engage in academic tasks that require them to either ***engage in*** Systems Analysis or ***examine*** a change in the system that has been tried (e.g. from history, literature, or current events).

Once learners are comfortable and confident with the Systems Analysis process, they can use it to engage in meaningful academic tasks. During planning teachers can:

- design *structured* tasks that provide learners with a system to be analyzed, the focus of the analysis, and the change;
- create *semi-structured* tasks that provide some information, but ask the learners to add certain aspects of their own;
- hold learners accountable for using the process; however, leave the task very open-ended.

In all three situations, the role of the teacher is to ensure all learners can engage in the decision making process and to provide guidance and feedback, as necessary.

DESIGN QUESTIONS

The following design questions will help you think about whether an Systems Analysis task would enhance the learning of a particular topic being studied:

- *Is there a system or parts of the system that could be analyzed?*
- *Is there a change in a system that could be analyzed using the systems analysis process guidelines?*

SAMPLE TOPICS

The following are suggested topics for Systems Analysis that might be used in the classroom. These ideas range from simple, quick classroom activities to more complex tasks that could be used as the focus for an entire unit or as a challenging comprehensive assessment. (These are provided to stimulate thinking. Obviously, learners would need further guidance when presented with these tasks, including more detailed directions and criteria for evaluating their work.)

- A story is really a system. Change some aspect of this story (character, setting, theme, plot) and talk about the effect it has on the other parts of the story.
- A government like ours with three branches is actually a system. Pose a potential change in one of the branches and hypothesize what would happen to the government as a whole.
- Select any of the following and make a change. Describe the effect of the change:
    - Ecosystem
    - Number system
    - Social system
    - Body system