Helping Students Thinking Critically: Paul’s Reasoning Model Across the Content Areas

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How People Learn

- Schema - build upon previous knowledge
  - must make connections
- Depth within a discipline is provided through the building of facts and application within a conceptual framework
- Discipline-based
  - processes are integrated within the content
- Guided by formative assessment
  - How People Learn, 2005
Developing Expertise

- Addressing Preconceptions & Concepts
  - Connecting to world
  - Overarching macroconcepts as a way to “frame” outside world
  - Appropriate content & understanding
- What does it mean to “do ….”
  - Inquiry and Investigation
  - Thinking Like a ….
  - Constructing meaning
- Metacognition
  - Reflecting on what was learned
  - Discussion
  - Feedback
  - Questions

National Research Council, 2005
Trends and Issues in A Global Economy

- Content-expertise
- Problem solving and reasoning
- STEM initiatives
- Global competitiveness
  - Identifying problems
  - Asking the right questions
  - Solving sophisticated problems
What does “think about it” imply?
Traits of A Great Thinker

(Elder & Paul, 2001)

- Raise important questions
- Gather and assess relevant information
- Test well-reasoned conclusions against relevant standards
- Think open-mindedly, recognizing and assessing their assumptions, implications, and consequences
- Communicate their ideas effectively
- Figure out solutions to complex problems through a well-reasoned process
- Consider other points of view/perspectives
Applications of Paul’s Reasoning Model

- Adjusting Questions, Task Demands, and Standards
- Reasoning Through Situations and Issues
- Issue-Based Research and Experimentation
- Writing Persuasively and Analyzing Reasons
Question Tree based on Reasoning Model

- What is the question or issue of interest? Why?
- What is the purpose of ________________? How do you know?
- What points of view or perspectives are important to understanding _________________? Provide evidence.
- What assumptions underlie each perspective on ________?
- What data/evidence support a given perspective on _____?
- What inference can be made about ________________, based on the evidence?
- What are the implications and consequences of __________?
Joe invested $1,000 in stock in January. When he sold it in December, the price was up 12% from his purchase price. What was his profit on this stock?

Which would you rather choose?
- a) 80% profit in year 1 and 50% loss in year 2.
- b) 5% profit in year 1 and 5% profit in year 2.

Explain the implications and consequences of each. Show your work.
Developing Questions Using Paul’s Reasoning Model

- What is the central issue or problem?
- How is the concept of systems fundamental to our understanding of science?
- What assumptions might we make in math when we are solving problems?
- What are the social implications of tourism on our economy?
- What are our inferences about weather if the sky is cloudy?
- After reading *Number the Stars*, what are the positive and negative implications from hiding Jewish families?
Standards of Reasoning & Teacher Stance

- **Depth**
  - What factors make this difficult?
  - What are some of the complexities of the question?
  - What are some of the difficulties we need to deal with?

- **Clarity**
  - Could you elaborate?
  - Provide an example.
  - Illustrate

- **Accuracy**
  - How could we check on that?
  - How could we find out if that is really true?
  - How could we verify or test that idea?

- **Fairness**
  - Is my thinking justifiable in context?
  - Am I taking into account the thinking of others?
  - Is my purpose fair for the given situation?
  - Am I using concepts appropriately or distorting them to get what I want?
Standards of Reasoning and Teacher Stance

- **Precision**
  - Could you be more specific?
  - Could you give me more details?
  - Could you be more exact?

- **Relevance**
  - How does that relate to the problem?
  - How does that help us with the issue at hand?

- **Significance**
  - Is this the most important problem to consider?
  - Is this the central idea to focus on?
  - Which of these facts are most important?

- **Breadth**
  - Do we need to look at this from another perspective?
  - Do we need to consider another point of view?
  - Let’s examine this in other ways.  

Elder & Paul, 2001
When asking questions, combine several categories. Focus on the standards of reasoning.
Non Example

- Rewrite the story from another point of view.
- What are the implications of the New Deal?
- What are the implications of geometry on billiards?
- What inferences can you make about matter and the transfer of energy given the experiment you just conducted?
- Read the article. What inferences can you make about the author’s point of view?

Example

- How would the theme be different if told from another point of view?
- What evidence do you have to support that the New Deal has positive implications on current policy? What issues are still present? What generalizations can we make that may be applicable today?
- How does generalization we just learned apply to a game of pool? Write a true equation and prove it.
- What evidence do you have to show that matter and the transfer of energy are related? What are the implications and consequences for NASA?
- Read the article. What assumptions does the author make about….? What are the implications and consequences of thinking that way? What additional points of view should be considered and why?
Standards Using Paul’s Model

- The students will be able to explain how voting can be used to make group decisions.
- The students will be able to identify how climate and landforms influence settlement in his/her state.
- The student will be able to discuss the predictable and random effects of voting to make decisions through the point of view of the candidates and stakeholders.
- The student will be able to identify the implications and consequences of geography and climate on settlement trends and current state demographics.
Standards & Paul’s Reasoning

- Describe what it means to find a specific percent of a number using real-life examples (a.6.4)
  - When might you use percentages to determine an amount of something? Provide an example.

- Examine the following graph. Explain the assumptions the author wants the reader to make by using percentages instead of actual numbers.

- Does your opinion on the situation change when you know the actual numbers? Why or why not?
4.2.: **Identify** the influences of setting on a selection

5.2: **Explain** the influence of setting

6.2: **Identify** the features of setting and explain their importance in literary text

- Analyze the implications of the setting of a text and how the setting impacts the main idea or theme.
Hamburger Model for Persuasive Writing (primary)

Introduction (State an opinion.)

Reason

Reason

Reason

Conclusion
Hamburger Model for Persuasive Writing

Introduction
(State an opinion.)

Reason

Elaboration

Reason

Elaboration

Reason

Elaboration

Conclusion
Dagwood Model

Claim/Opinion/Introduction
- Details
- Background
- Reason
  - Elaboration
- Other Points of View
  - Elaboration

Conclusion
Look, Mom, I think it’s time that I get a new ten-speed bike. First of all, my old one is too small for me. I keep bumping my knees on the handlebars! Another reason is that a ten-speed is much faster, and I could ride farther. In that case, you would not have to drive me to my friends’ houses or to baseball practice. Finally, I think I deserve a new bike. I have good grades, and always help with chores around the house. As you can see, it would be helpful to both of us for me to have a new bike.
Elements of Reasoning

- Purpose/Goal
- Point of View
- Evidence/Data
- Assumptions
- Inferences
- Concepts/Ideas
- Implications/Consequences

-- Paul, 1992
Reasoning about a Situation or Event

What is the situation?

Who are the stakeholders?

What is the point of view for each stakeholder?

What are the assumptions of each group?

What are the implications of these views?
Sample Reasoning Discussions

- Perspectives from a period or event in history
  - Revolutionary War - should we fight?
  - Iraq War - Should we withdraw
  - Euro vs. dollar - currency

- Character dilemmas in a story
  - Various character points of view with author point of view

- Current events and world problems
  - Does the current economic policy protect the poor?
  - Should the US set sanctions on N. Korea or Iran?

- Ethical dilemmas and issues
  - Should we build a playground on the beach?
  - Should we allow stem cell research?
  - Should we encourage the building of nuclear power plants?
Characteristics of an Issue for Research

- Real world
- Multiple points of view
- Researchable and substantial information available
- Worthy topic and personal involvement
- Linked to Reasoning Model
Issue Versus Topic

- **Topic**
  - Pollution
  - Bugs
  - War in Iraq
  - Thomas Jefferson

- **Issue**
  - What policy changes need to be made to protect U.S. citizens from pollution?
  - Which bug is most important to the environment & why?
  - Should the US troops withdraw or remain in Iraq?
  - What are the implications and consequences of Thomas Jefferson’s contributions on life today?
Issue Versus Topic

- **Topic**
  - Pollution
  - Bio-diesel fuel conversion
  - Vietnam War
  - Anthropology

- **Issue**
  - What impact does China’s pollution policies have on the world?
  - Is bio-diesel a cost-efficient alternative?
  - Was the Vietnam War worth fighting?
  - How does language vary across various US regions?
Moving Scenario – Reasoning, Writing, and Research

You work for a moving company that plans to submit a bid for moving the contents of an office building to a new location. Determine the minimum volume of furniture and equipment that must be moved. The exemplary product should take into account the stackability of the items; interlocking nature of noncubical pieces; padding to protect the furniture; and number and size of boxes needed to pack the small items.

- Prepare a written report specifying the volume of items to be moved, your rationale for the findings, and a chart showing how the items will be placed to maximize the volume needed.
Three Door Monte-Hall Problem

- You are on a game show and given the choice of three doors. Behind one door is a desirable prize (cash, Gameboy, etc.); behind the other two doors is a prank prize (e.g. goat, frozen vegetables, etc.). You pick door number one and the host opens door number three and reveals a junk prize. Then he says: “Do you want to change your selection to door number 2?”

- Should you switch? Why or why not?
  - See online simulation: www.shodor.org/interactivate/activities/monty3
“Change is the law of life. And those who look only to the past or present are certain to miss the future.”---JFK