

PAUL AND ELDER'S ELEMENTS OF REASONING

The Elements of Reasoning is found on the internet by Gilbert Public Schools - Gilbert, Arizona <http://www.gilbert.k12.az.us/index.html>.

The Elements of Reasoning

Teachers sometimes struggle with crafting good critical thinking questions that get at the heart of the problem. Richard Paul and Linda Elder from the Foundation of Critical Thinking developed the Elements of Reasoning to address the underlying elements of logical and critical thinking. Although you may want to add some of your own, the eight elements they identified are excellent. Good critical thinking questions are the fall out of considering the Elements. Below is a brief outline of Paul and Elder's Elements of Reasoning.

1. What are the fundamental goals and objectives of the lesson?
2. What is the question or problem at issue you are trying to answer or solve?
3. What information or data do you need to answer the problem or issue?
4. What is the information or data telling you? What inferences and interpretations can you legitimately make?
5. What are the implications or consequences of your thinking (what follows from thinking this rather than that)?
6. What are the key ideas or concepts that will help you answer the question or solve the problem?
7. What are your assumptions (should you be taking this or that for granted)?
8. Are you adopting the most reasonable point of view

with respect to the issue?

Annotated from Richard Paul and Linda Elder's "Critical Thinking: Teaching Students To Seek the Logic of Things"

Universal Intellectual Standards

Students should be taught what intellectual standards for which they are held accountable. Richard Paul and Linda Elder of the Foundation for Critical Thinking have identified eight standards students should learn. You may want to add some of your own, but be careful that your final list of standards is short enough for students to grapple with -- this is another venue where "less can be more."

Below are Paul and Elder's list of Universal Intellectual Standards.

Clarity-Could you elaborate further?
Could you illustrate what you mean?
Could you give me an example?

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

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 bear on the question?
How does that help us with the issue?

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

Breadth-Do we need to look at this from another perspective?

Do we need to consider another point of view?
Do we need to look at this in other ways?

Logic-Does all this make sense together?
Does your first paragraph fit in with your last?
Does what you say follow from the evidence?

Significance-Is this the most important problem to consider?

Is this the central idea to focus on?
Which of these facts are the most important?

Incorporating Bloom's Taxonomy

The *Teaching for Thinking* technique depends on the teacher thinking critically about his or her lesson and posing questions that move students beyond basic fact recall. An indication that a lesson has too many recall questions and not enough higher level questions is the reactions of your students. Having to answer 60-plus recall questions in a lesson is not very interesting, challenging or exciting. If your students are bored, examine the level of questions you ask. Be sure to move into the upper levels of Bloom's taxonomy to challenge students to think.

Bloom's Taxonomy

1. **Knowledge:** arrange, define, duplicate, how, how much, label, list, memorize, name, order, recognize, relate, recall, repeat, reproduce, state, who, what, why, when.
2. **Comprehension:** classify, demonstrate, describe, discuss, explain, express, identify, indicate, infer, judge, locate, recognize, report, restate, review, select, translate.

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3. **Application:** apply, choose, demonstrate, dramatize, employ, explain, illustrate, interpret, operate, practice, predict, schedule, show, sketch, solve, summarize, use, write, "what would happen if?"
4. **Analysis:** analyze, appraise, test calculate, categorize, compare, contrast, criticize, differentiate, discriminate, distinguish, examine, experiment, question, "what conclusions can you make?"
5. **Synthesis:** arrange, assemble, collect, compose, construct, create, design, develop, formulate, "how would you test." manage, organize, plan, prepare, propose, set up, write.
6. **Evaluation:** appraise, argue, assess, attach, choose compare, defend, estimate, find the errors, judge, predict, rate, core, select, support, value, evaluate.

cepts and definitions used, analyzing the assumptions made, analyzing the point of view, comparing, explaining, inferring, analogies, sequencing.

Questions are asked that help students apply, extend and evaluate the concepts or principles - forecasting, generalizing, recognizing implications and consequences, judging, predicting, constructing, generalizing, hypothesizing, extrapolating.

Review questions are asked to review concepts, evaluate student judgments, and the main ideas of the lessons.

All students participate - even if students do not have their hands up.

Students are called on randomly.

"I don't know" is not an acceptable answer - teacher re-directs, restates the question, has another student answer and has the first student summarize that answer, or comes back to the student with another question later in the lesson.

The name of the student comes at the end of the question.

Now Add Socratic Questioning

Basic Questioning Technique Used in *Teaching for Thinking*

Students can read the material aloud, a paragraph or block of text at a time, (if age and lesson appropriate) or they can be questioned over material that has been assigned or they have learned previously.

Visual materials (maps, graphs, tables, etc.) are studied by students for a few minutes before questioning.

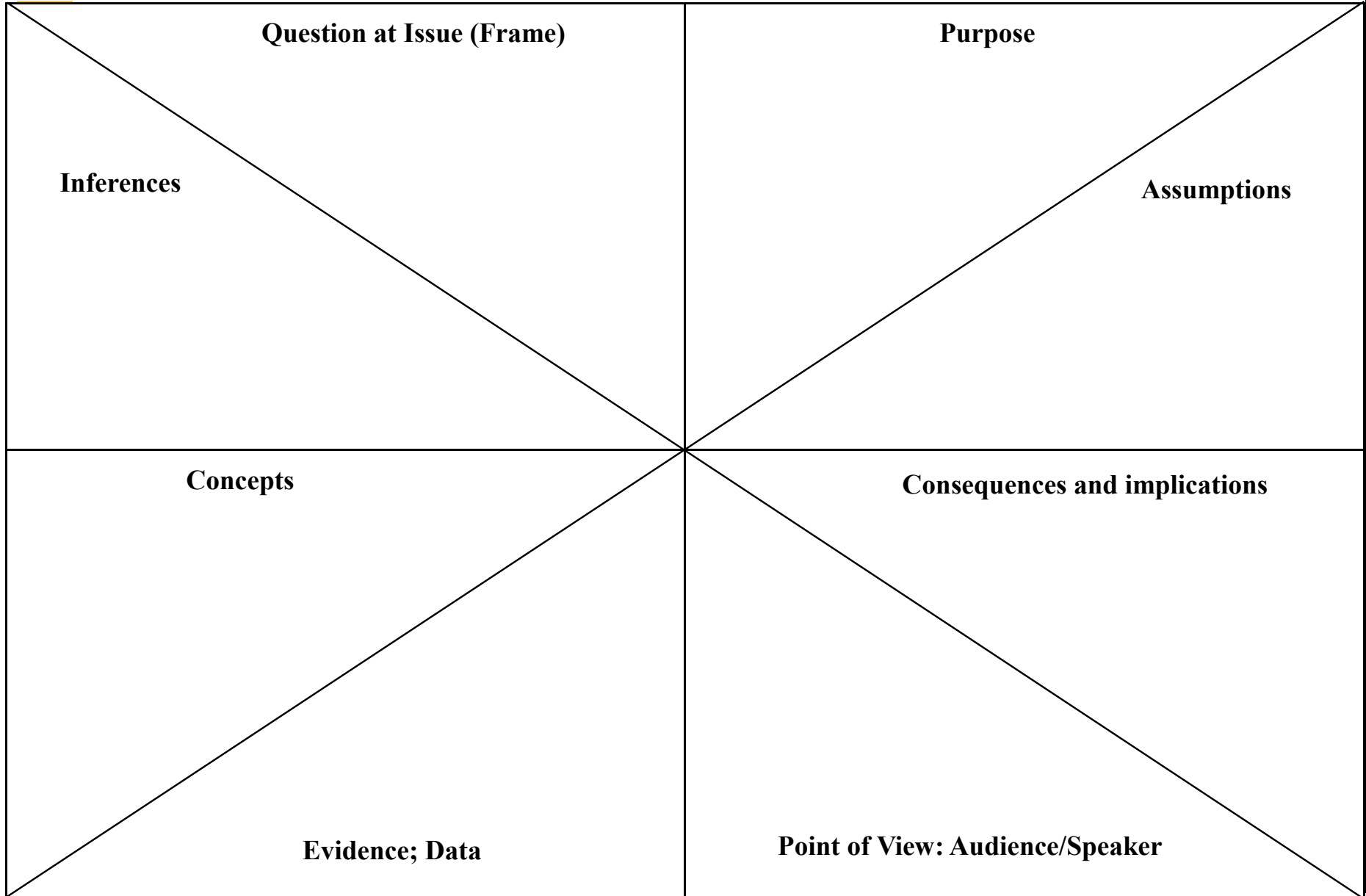
Questions are asked that help students make sense of the information or concept - identifying the goal, recognizing the key question or problem, identifying and analyzing the pertinent information, identifying the con-

ELEMENTS OF THOUGHT

Graphic Organizer

Name _____

Date _____



ELEMENTS OF THOUGHT —R. PAUL

Eight elements of thought identified by Richard Paul (1992) are the basic building blocks of productive thinking. Working together, they provide a general logic to reasoning. In literature interpretation and listening, they help one make sense of the reasoning of the author or speaker. In writing and speaking, they enable authors or speakers to strengthen their arguments.

Students are often asked to distinguish between facts and opinions. However, between pure opinion and hard facts lie reasoned judgments in which beliefs are supported by reasons. Instruction in this area needs to be included in all forms of communication in the language arts.

Teachers may use the elements to assist in crafting questions for class discussion of literature or questions for probing student thinking. Examples of such questions are given on the Wheel of Reasoning that follows the descriptions below.

The eight elements of reasoning are as follows:

Purpose, Goal, or End View

We reason to achieve some objective, to satisfy a desire, to fulfill some need. For example, if the car does not start in the morning, the purpose of my reasoning is to figure out a way to get to work. One source of problems in reasoning is traceable to "defects" at the level of purpose or goal. If our goal itself is unrealistic, contradictory to other goals we have, confused or muddled in some way, then the reasoning we use to achieve it is problematic. If we are clear on the purpose for our writing and speaking, it will help focus the message in a coherent direction. The purpose in our reasoning might be to persuade others. When we read and listen, we should be able to determine the author's or speaker's purpose.

Question at Issue (or Problem to Be Solved)

When we attempt to reason something out, there is at least one question at issue or problem to be solved (if not, there is no reasoning required). If we are not clear about what the question or problem is, it is unlikely that we will find a reasonable answer, or one that will serve our purpose. As part of the reasoning process, we should be able to formulate the question to be answered or the issue to be addressed. For example, why won't the car start? or should libraries censor materials that contain objectionable language?

Points of View or Frame of Reference

As we take on an issue, we are influenced by our own point of view. For example, parents of young children and librarians might have different points of view on censorship issues. The price of a shirt may seem low to one person while it seems high to another because of a different frame of reference. Any defect in our point of view or frame of reference is a possible source of problems in our reasoning. Our point of view may be too narrow, may not be precise enough, may be unfairly biased, and so forth. By considering multiple points of view, we may sharpen or broaden our thinking. In writing and speaking, we may strengthen our arguments by acknowledging other points of view. In listening and reading, we need to identify the perspective of the speaker or author and understand how it affects the message delivered.

Experiences, Data, Evidence

When we reason, we must be able to support our point of view with reasons or evidence. Evidence is important in order to distinguish opinions from reasons or to create a reasoned judgment. Evidence and data should support the author's or speaker's point of view and can

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strengthen an argument. An example is data from surveys or published studies. In reading and listening, we can evaluate the strength of an argument or the validity of a statement by examining the supporting data or evidence. Experiences can also contribute to the data of our reasoning. For example, previous experiences in trying to get a car to start may contribute to the reasoning process that is necessary to resolve the problem.

Concepts and Ideas

Reasoning requires the understanding and use of concepts and ideas (including definitional terms, principles, rules, or theories). When we read and listen, we can ask ourselves, "What are the key ideas presented?" When we write and speak, we can examine and organize our thoughts around the substance of concepts and ideas. Some examples of concepts are freedom, friendship, and responsibility.

Assumptions

We need to take some things for granted when we reason. We need to be aware of the assumptions we have made and the assumptions of others. If we make faulty assumptions, this can lead to defects in reasoning. As a writer or speaker we make assumptions about our audience and our message. For example, we might assume that others will share our point of view; or we might assume that the audience is familiar with the First Amendment when we refer to "First Amendment rights." As a reader or listener we should be able to identify the assumptions of the writer or speaker.

Inferences

Reasoning proceeds by steps called inferences. An inference is a small step of the mind, in which a person concludes that something is so because of something else being so or seeming to be so. The tentative conclusions (inferences) we make depend on what we assume as we attempt to make sense of what is going on around us. For example, we see dark clouds and infer that it is going to rain; or we know the movie starts at 7:00; it is now 6:45; it takes 30 minutes to get to the theater; so we cannot get there on time. Many of our inferences are justified and reasonable, but many are not. We need to distinguish between the raw data of our experiences and our interpretations of those experiences (inferences). Also, the inferences we make are heavily influenced by our point of view and our assumptions.

Implications and Consequences

When we reason in a certain direction, we need to look at the consequences of that direction. When we argue and support a certain point of view, solid reasoning requires that we

consider what the implications are of following that path; what are the consequences of taking the course that we support? When we read or listen to an argument, we need to ask ourselves what follows from that way of thinking. We can also consider consequences of actions that characters in stories take. For example, if I don't do my homework, I will have to stay after school to do it; if I water the lawn, it will not wither in the summer heat.

Adapted from Paul, R. (1992). *Critical thinking: What every person needs to survive in a rapidly changing world*. Sonoma, CA: Foundation for Critical Thinking.