ED 3780

Part F: Inquiry Learning and Teaching for Thinking

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Study Skills Ideas

When you study, you are engaged in metacognition: the brain thinks about what the brain is thinking. During study time, your metacognition generally has three components: (1) planning before reading to pick the best strategies and to give yourself a reason to read, (2) monitoring during study to determine if you are still on target, and (3) assessing during and after study to determine if goals were met or if more study is needed. Each of the study skills listed here fits one of the three categories, before, during, or after.

Before: Planning Study
1. **Skimming.** Before reading the article, skim it first. The steps to effective skimming include:
   a. Look over the title, section headings and study any graphs or illustrations. Then, read the first and last paragraphs.
   b. Read the first sentence of every paragraph.
   c. Record in your own words the key points of your reading so far.
   d. Go back over the article more carefully now, finding support and examples to add to your key ideas.

2. **Brainstorming and Predicting.** This is really like a game you play with yourself as you study.
   a. Study the title: predict what the article is about.
   b. Study the graphs and illustrations: what do illustrations suggest?
   c. Combine ideas from both title and illustrations and brainstorm many possible predictions about this article.
   d. Begin reading the article paragraph by paragraph. After each paragraph, check the ideas that you predicted correctly. When you finish, cross out any predictions that were not in the article. Add ideas from the article not on the list. Your remaining list should represent the main ideas of the article.

During: Monitoring and Assessing Study
3. **Outline.** As you read, develop an outline of major headings and supporting points.

4. **Semantic Web.** Decide the major concept in the article. Using that concept as the center of a semantic web, finish the web while carefully reading and rereading the article. See the illustration below:
5. **Underlining and margin notes.** Read and study the article by making notes to yourself in the margins. Underline any main ideas and circle key vocabulary. Review the article so that you are prepared to discuss it.

6. **Dual-Entry Note Page.** Divide a piece of binder paper lengthwise. In the left column record specific details and quotations. Include things that are interesting, confusing, or probably important. In the right column write your own comments, questions, reactions, observations regarding the left-column material. See the illustration below:

Reference

Direct quotes

Page #

Your impressions

---

**After: Assessing Study**

7. **Summary.** Read and study the article. After you have familiarized yourself with the article, write a summary of it. Capture the main ideas and significance of the article in less than 200 words (no more than would fit a 3x5 card).

8. **Annotated Note.** After reading the article, write an annotated note. An annotated note includes the citation to the article, briefly highlights the key points and includes your own response to the ideas.
9. **Questions.** Read and study the article. Then compose 6-10 questions you think are important in discussing both the content and the evaluation of the author's ideas. Use thinking taxonomies such as Bloom's to get at higher order thinking.

10. **Pattern Guide.** Create a pattern guide for this article that another student could use to help him or her see the way this author has organized the information. Some possible patterns are: enumeration, chronological, comparison/contrast, cause/effect, problem/solution. A five paragraph essay is also a pattern. Some patterns might be represented visually.

11. **Compare and contrast.** After reading more than one article on a single topic, or when an article presents differing points of view about an issue, use a Venn diagram to show how the ideas are alike (compare), and how they are different (contrast). See the illustration:

```
   Unique to A
   Shared
   Unique to B

Set 1
Set 2
```

12. **Illustration.** Read and study the article any way you wish. However, after your study, prepare or explain an additional illustration (cartoon, graph, etc.) which could effectively accompany this article.
# Patterns of Instructional Models for Teaching for Thinking

## Types of Instructional Objectives and Models

<table>
<thead>
<tr>
<th><strong>Type I Objectives</strong> – Acquisition of facts, rules, action sequences</th>
<th><strong>Type II Objectives</strong> – Acquisition of concepts, patterns, abstractions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>USE:</strong> Convergent questions</td>
<td><strong>USE:</strong> Divergent questions</td>
</tr>
<tr>
<td>Knowledge, comprehension, application</td>
<td>Analysis, synthesis, evaluation (inductive/deductive reasoning)</td>
</tr>
<tr>
<td><strong>Direct Instruction</strong> (Hunter)</td>
<td><strong>Indirect Instruction</strong> (Also known as Discovery Learning, Inquiry Learning or Socratic Method)</td>
</tr>
</tbody>
</table>
| • Anticipatory Set (review) | • (Objective)  
| • Objective | • Stimulus (Observation) |
| • Instructional Input | • Focus |
| • Modeling | • Concept Development  
  – Hypothesis |
| • Check for Understanding | • – Hypothesis Testing |
| • Guided Practice | • Generalization |
| • Independent Practice  
  – Extensions  
  – Correctives | • Feedback |
| • Closure | **OR**  
| | • Stating Problem |
| | • Stating Research Objectives |
| | • Collecting Data |
| | • Interpreting Data |
| | • Drawing conclusions |
| **OR**  
| | **Concept Lesson**  
| | • Name concept |
| | • Define concept |
| | • Give examples/non-examples |
| | • List attributes/non-attributes |
| | • Generalize |
| | • Feedback |
Inductive, Self-Discovery, or Indirect Teaching-Learning Model

1. Teacher introduces problem, dilemma, controversy, or inquiry by providing data for students to "uncover" or discover.
2. Students are given time to mess around with possibilities as they attempt to describe the problem and search for optional solutions (through a lab, role-play, discussion, question-answer, experiments, etc.)
3. Students hypothesize and try to develop, organize, and categorize data in an effort to support their hypothesis.
4. Students draw conclusions or deduce generalities from the specifics of their data.

Teachers facilitate the process, realizing that the meaning of the lesson comes from the students in contact with the information; students may not always arrive at the same place as the teacher thought they should or would. In that way, the teacher becomes a learner along with the students and examines her/his own assumptions about the material.

The inquiry lesson plan contains the objectives, description of the problem or dilemma, the strategy the teacher will use to introduce it, the questions/prompts the teacher will use to begin the exploration, and the essential conceptual principles that should emerge from the discovery. An approximate time frame for each part of this lesson is also very helpful.

Tell a child WHAT to think, and you make him a slave to your knowledge. Teach a child HOW to think, and you make all knowledge his slave.

- Henry A. Taitt
OFICA: A Questioning Technique for Higher-Order Thinking

OFICA is an acronym for a questioning pattern designed to encourage higher order thinking during class discussion. The teacher can use OFICA to develop classic inquiry lessons that encourage students to discover new concepts for themselves. After selecting the content for the lesson and developing a clear lesson objective, design questions for each letter of the acronym. Begin the lesson with a lively introduction that creates a mind set for what is to follow.

Objective: What do you want students to know and do as a result of participating in this lesson?

Introduction: A stimulus that sets the stage for the lesson

O Open-Ended Questions
- are questions that produce many "right" answers.
- ask students to build a common frame of reference or a factual base from which they can abstract concepts and generalizations.

F Focus Questions
- bring attention to the specific concepts that are the intent of the discussion.

I Interpretive Questions
- ask students to build meaning by noting relationships among concepts and making connections with previous experience.

C Capstone Questions
- ask students to tie concepts together by summarizing, generalizing, stating the "big idea," or "headlining" the discussion.

A Application Questions
- ask students to consider, "What does this matter to me? How might I use what I have learned?"
- allow students to use the generalizations they have drawn in new and creative ways.

Dr. Beverly Cutler developed OFICA based on the work of Hilda Taba and field tested the method at Brigham Young University.
Sample OFICA Lessons

Sample One

Course: Teaching Strategies
Content: Thinking Skills

Rationale: This lesson is an introductory experience dealing with inquiry teaching and/or teaching for thinking. The model used for this lesson plan, OFICA, is an example of inquiry teaching as well as a model for using questioning to move students to higher levels of thinking. In a subsequent class period, students will be required to use the OFICA model to develop a lesson for a peer teaching experience. Students may also select OFICA as a model for developing an inquiry/thinking skills lesson for their final TWS of the semester.

Objective: In their study of teaching methods, students will form generalizations relative to human thinking and learning and will share what they have learned in classroom discussion.

Introduction: Explain the brainstorming process you will use.

O List as many, varied words as you can think of that relate to thinking.

F How do you suppose people learn to think?

I What does that have to do with our roles as parents, teachers, and leaders? (What does that have to do with pedagogy?)

C Take a moment and write down what for you is a key idea from our discussion. Be prepared to share your idea with the class.

A Apply what you have discovered about the OFICA pattern of questioning to understanding the remainder of today’s presentation.

Follow up: Explain and analyze the OFICA model used in this lesson.
Sample Two

Course: Teaching Strategies
Content: Educational Philosophy--Metaphors for Students

Rationale: This lesson follows an explanation of the OFICA questioning model. Its purpose is to give students the opportunity to immediately see OFICA modeled and to reflect on its use in a classroom situation.

Materials: Variety of pictures of cactus plants.

Objective: In their study of teaching strategies, students will participate in the following discussion with the purpose of analyzing and reflecting on the use of the OFICA questioning strategy. They will share what they have learned in class discussion and in write-to-learn journal entries.

Introduction: Display a variety of pictures of cactus plants.

O What do you see?
   (Take from the display four preselected pictures that can be arranged in a variety of sequences.)

F Focus on just these four pictures. How are they alike? How are they different?

I Put the pictures in a sequence that makes sense to you.

C Give your sequence a name and explain why you think the name suits the pattern.

A What might this sequence stand for if it were to be a metaphor for your relationship with your students?

Follow-up: Invite groups of students to produce OFICA questioning sequences at the chalkboard for peer and teacher feedback prior to developing and presenting short OFICA lessons to their peers.
Effective Questioning

It is more important to ask good questions than to give good answers.

Thought-full Language
(Costa & Lowery, 1989, p. 53, 62)

Teachers must learn how to embed in their everyday classroom language opportunities for students to hear cognitive terminology and be presented with day-to-day challenges to think.

Language is a tool. As such, we can use it to enhance cognitive development. Speaking thought-fully simply means that we consciously use our language to evoke thinking in others by:

- using specific thinking terms rather than vague abstract terms;
- posing questions that cause students to examine their own behavior, search for the consequences of that behavior, and choose more appropriate actions for themselves;
- giving data, divulging information about ourselves, or sending "I" messages so that students must "process" the information;
- causing students to analyze a task, decide on what is needed, then act autonomously;
- causing others to define their terms, become specific about their actions, make precise comparisons, and use accurate descriptors;
- causing the covert thought processes that students are experiencing to become overt (metacognition); and
- helping children study and become alert to the cues in the language structure which evoke thought processes.

By asking questions, selecting terms, clarifying ideas and processes, providing data, and withholding value judgments, we can stimulate and enhance the thinking of others. Using thought-full language, we can "grow" intelligent behavior.

Examples

<table>
<thead>
<tr>
<th>Instead of saying:</th>
<th>Speak thought-fully, saying:</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Let's look at these two specimens.&quot;</td>
<td>&quot;Let's compare these two specimens.&quot;</td>
</tr>
<tr>
<td>&quot;What do you think will happen?&quot;</td>
<td>&quot;What do you predict will happen when . . .?&quot;</td>
</tr>
<tr>
<td>&quot;How can you put into groups . . .?&quot;</td>
<td>&quot;How might you classify . . .?&quot;</td>
</tr>
<tr>
<td>&quot;What do you think would have happened if . . .?&quot;</td>
<td>&quot;What do you speculate might have happened if . . .?&quot;</td>
</tr>
<tr>
<td>&quot;How can you explain . . .?&quot;</td>
<td>&quot;What hypotheses do you have that might explain . . .?&quot;</td>
</tr>
<tr>
<td>&quot;How do you know that's true?&quot;</td>
<td>&quot;What evidence do you have to support . . .?&quot;</td>
</tr>
</tbody>
</table>

(adapted from Costa & Lowery, 1989; p. 55-56)
### Taxonomy of Educational Objectives: Cognitive Domain
(Bloom’s Taxonomy)

<table>
<thead>
<tr>
<th>Knowledge</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Defining terminology, symbols</td>
<td>- Recognizing assumptions, patterns</td>
</tr>
<tr>
<td>- Recalling facts, names, examples, rules, categories</td>
<td>- Deducing conclusions, hypotheses, points of view</td>
</tr>
<tr>
<td>- Recognizing trends, causes, relationships</td>
<td>- Analyzing relationships, themes, evidence, causes and effects</td>
</tr>
<tr>
<td>- Acquiring principles, procedures, implications, theories</td>
<td>- Contrasting ideas, parts, arguments</td>
</tr>
</tbody>
</table>

**Key Term:** remember

<table>
<thead>
<tr>
<th>Comprehension</th>
<th>Synthesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Rephrasing definitions</td>
<td>- Producing products, compositions</td>
</tr>
<tr>
<td>- Illustrating meanings</td>
<td>- Proposing objectives, means, solutions</td>
</tr>
<tr>
<td>- Interpreting relationships</td>
<td>- Organizing taxonomies, concepts, schemes, theories</td>
</tr>
<tr>
<td>- Drawing conclusions</td>
<td>- Deriving relationships, abstractions, generalizations</td>
</tr>
<tr>
<td>- Demonstrating methods</td>
<td>-</td>
</tr>
<tr>
<td>- Inferring implications</td>
<td>-</td>
</tr>
<tr>
<td>- Predicting sequences</td>
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</tbody>
</table>

**Key Term:** understand

<table>
<thead>
<tr>
<th>Application</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Applying principles, rules, theories</td>
<td>- Judging accuracy, consistency, reliability</td>
</tr>
<tr>
<td>- Organizing procedures, conclusions, effects</td>
<td>- Assessing errors, fallacies, predictions, means and ends</td>
</tr>
<tr>
<td>- Choosing situations, methods</td>
<td>- Considering efficiency, utility, standards</td>
</tr>
<tr>
<td>- Restructuring processes, generalizations, phenomena</td>
<td>- Contrasting alternatives, courses of action</td>
</tr>
</tbody>
</table>

**Key Term:** use

<table>
<thead>
<tr>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Judgement based on criteria</td>
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</tbody>
</table>

**Key Term:** judgement based on criteria

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Questioning for Quality Thinking
within Bloom’s Taxonomy

**Knowledge**—identification and recall of information
- Who, what, when, where, how questions
- Describe __________________

**Comprehension**—organization and selection of facts and ideas
- Retell ________________ in your own words.
- What is the main idea of ________________?

**Application**—use of facts, rules, and principles
- How is ______________ an example of ______________?
- How is ______________ related to ______________?
- Why is ______________ significant?

**Analysis**—separation of a whole into its component parts
- What are the parts or features of ________________?
- Classify ______________ calculated according to ____________?
- Outline/diagram/web __________________.
- What evidence can you list for ________________?

**Synthesis**—combination of ideas to form a new whole
- What would you predict/infer from ________________?
- What ideas can you add to ________________?
- How would you create/design a new ________________?
- What might happen if you combined ______ with ______?
- What solutions would you suggest for ________________?

**Evaluation**—development of opinions, judgments, or decisions
- Why do you agree/disagree with ________________?
- What do you think about ________________?
- What is the most important ________________?
- Prioritize ____________________________.
- How would you decide about ________________?
- What criteria would you use to assess ________________?
Cues for Using Bloom’s Taxonomy to Plan Instruction

Use this list to guide the development of instructional objectives that will require a variety of thinking processes. Choosing a verb that matches the level, by itself, is not enough to ensure that your students will work at that particular level. Make sure the use of the verb matches the definition of the thinking level. Requiring a compatible product will aid in making sure students are working at the desired level of thinking.

**Knowledge**—Remembering of previously learned material. All that is required is the bringing to mind of previously learned material.

**Representative Verbs:**
- ask
- describe
- know
- locate
- observe
- recall
- remember
- state

**Representative Verbs:**
- acquire
- distinguish
- label
- match
- practice
- recite
- repeat
- tabulate

**Representative Verbs:**
- copy
- identify
- list
- memorize
- quote
- recognize
- reproduce
- trace

**Representative Verbs:**
- define
- indicate
- listen
- name
- read
- rehearse
- review
- word for word

**Compatible Products:**
- checklist
- definition
- fact
- fill-in-the-blank
- glossary
- information table
- label
- list
- quote
- chart
- reproduction
- recitation
- test
- worksheet

**Comprehension**—The ability to grasp the meaning of material.

**Representative Verbs:**
- associate
- demonstrate
- differentiate
- estimate
- extrapolate
- give examples
- interpret
- prepare
- rename
- restate
- summarize

**Representative Verbs:**
- change
- describe
- discuss
- explain
- fill in
- illustrate
- outline
- read
- reorder
- rewrite
- symbolize

**Representative Verbs:**
- conclude
- determine
- distinguish
- express
- generalize
- infer
- paraphrase
- rearrange
- separate
- tell

**Representative Verbs:**
- convert
- diagram
- draw
- extend
- give in own words
- predict
- relate
- represent
- show
- transform
Compatible Products:

- book report
- bullet chart
- bulletin board
- brochure
- classified ad
- collage
- documentary
- essay
- group discussion
- oral presentation
- poster
- role play
- speech
- time line

**Application**—The ability to use learned material in new and concrete situations.

Representative Verbs:

- apply
- assemble
- change
- calculate
- classify
- complete
- compute
- construct
- demonstrate
- develop
- diagram
- discover
- displays
- dramatize
- draw
- employ
- estimate
- examine
- graph
- illustrate
- make
- manipulate
- measure
- modify
- operate
- organize
- practice
- predict
- prepare
- produce
- record
- relate
- restructure
- rewrite
- show
- sketch
- solve
- survey
- transfer
- use
- utilize

Compatible Products:

- collection
- computer demo
- diagram
- diary
- diorama
- game
- illustration
- map
- mock interview
- model
- paragraph
- panel discussion
- puzzle
- radio/TV commentary
- report
- speech

**Analysis**—The ability to break down material into its component parts so that its organizational structure may be understood.

Representative Verbs:

- abstract
- analyze
- break down
- categorize
- classify
- compare
- contrast
- deduce
- detect
- diagram
- differentiate
- discriminate
- dissect
- distinguish
- group
- infer
- inspect
- investigate
- measure
- order
- organize
- outline
- point out
- recognize
- relate
- sketch
- select
- separate
- subdivide
- survey
- take apart
### Synthesis

The ability to put parts together to form a new whole. Synthesis stresses the formulation of new patterns or structures.

#### Representative Verbs:

<table>
<thead>
<tr>
<th>Verbs</th>
<th>Verbs</th>
<th>Verbs</th>
<th>Verbs</th>
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</thead>
<tbody>
<tr>
<td>arrange anew</td>
<td>combine</td>
<td>compile</td>
<td>compose</td>
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<tr>
<td>constitute</td>
<td>construct</td>
<td>create</td>
<td>derive</td>
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<td>design</td>
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<td>forecast</td>
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<td>generate</td>
<td>imagine</td>
<td>improve</td>
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<td>integrate</td>
<td>invent</td>
<td>hypothesize</td>
<td>modify</td>
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<td>originate</td>
<td>organize</td>
<td>plan</td>
<td>predict</td>
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<td>prepare</td>
<td>prescribe</td>
<td>produce</td>
<td>propose</td>
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<tr>
<td>put together</td>
<td>rearrange</td>
<td>reconstruct</td>
<td>relate</td>
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<tr>
<td>reorganize</td>
<td>revise</td>
<td>simplify</td>
<td>synthesize</td>
</tr>
<tr>
<td>systemize</td>
<td>transmit</td>
<td>write</td>
<td></td>
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</tbody>
</table>

#### Compatible Products:

<table>
<thead>
<tr>
<th>Products</th>
<th>Products</th>
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<tbody>
<tr>
<td>art product</td>
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<td>joke</td>
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<td>prediction</td>
<td>project</td>
</tr>
<tr>
<td>solution</td>
<td>story</td>
<td>video tape</td>
<td></td>
</tr>
</tbody>
</table>
Core Thinking Skills

Focusing Skills defining problems, setting goals

Information-Gathering Skills observing, formulating questions

Remembering Skills encoding, recalling

Organizing Skills comparing, classifying, ordering, representing

Analyzing Skills identifying attributes and components: such as main ideas, relationships and patterns, and errors

Generating Skills inferring, predicting, elaborating

Integrating Skills summarizing, restructuring

Evaluating Skills establishing criteria, verifying

Questioning

1. Ask them.
2. Open-ended questions (more than one right answer)
3. Higher level questions (upper end of Bloom’s taxonomy)
4. Wait time (sometimes 10-15 seconds which is a long time; don’t call on the first person to raise his/her hand; don’t answer your own question, but rephrase and ask it a different way; sometimes give “think time” before you allow anyone to raise his/her hands)
5. Probe (ask more than one question; ask “why?” they are thinking this way; go deeper)

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