ED 3780

Part F: Inquiry Learning and Teaching for Thinking

Contents:

Page

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.

<u>Before: Planning Study</u>

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.

<u>During: Monitoring and Assessing Study</u>

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:
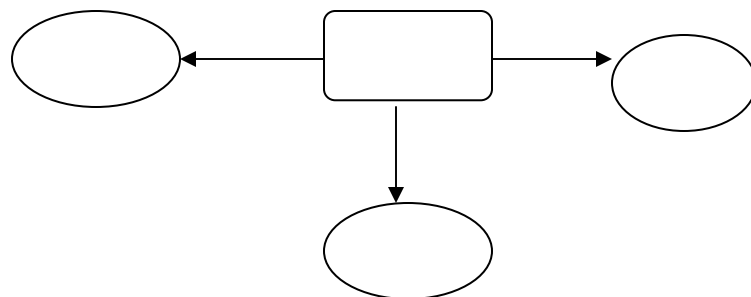
5. **Underlining and margin notes**. Read and study the article by making notes to yourself in the margins. Underline any main ideas and circle key vocabulary. Review the article so that you are prepared to discuss it.

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:
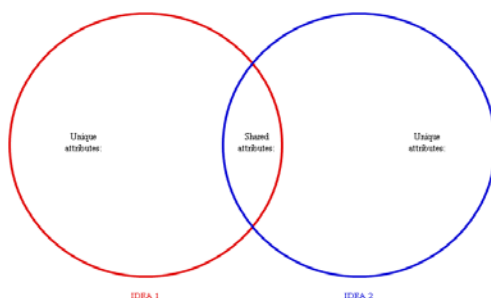
12. **Illustration**. Read and study the article any way you wish. However, after your study, prepare or explain an additional illustration (cartoon, graph, etc.) which could effectively accompany this article.

Patterns of Instructional Models
for Teaching for Thinking

Types of Instructional Objectives and Models

Type I Objectives-- Acquisition of facts, rules, action sequences	**Type II Objectives–** Acquisition of concepts, patterns, abstractions

USE:
Convergent questions
 	
Knowledge, comprehension, application
 	
Direct Instruction (Hunter)
•   Anticipatory Set (review)
 	
•   Objective
 	
•   Instructional Input
 	
•   Modeling
 	
•   Check for Understanding
 	
•   Guided Practice
 	
•   Independent Practice
      – Extensions
      – Correctives
 	
•   Closure
	USE:
	Divergent questions
	
	Analysis, synthesis, evaluation (inductive/ deductive reasoning)
	
	Indirect Instruction (Also known as Discovery Learning, Inquiry Learning or Socratic Method)
	
	• (Objective)
	• Stimulus (Observation)
	• Focus
	• Concept Development
	   – Hypothesis
	   – Hypothesis Testing
	• Generalization
	• Feedback
	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 it 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

Instead of saying:	Speak thought-fully, saying:
"Let's look at these two specimens."	"Let's *compare* these two specimens."
"What do you think will happen?"	"What do you *predict* will happen when. . .?"
"How can you put into groups. . .?"	"How might you *classify* . . .?"
"What do you think would have happened if . . .?"	"What do you *speculate* might have happened if . . . ?"
"How can you explain. . . ?"	"What *hypotheses* do you have that might explain. . .?"
"How do you know that's true?"	"What *evidence* do you have to support. . . ?"

(adapted from Costa & Lowery, 1989; p. 55-56)

Taxonomy of Educational Objectives: Cognitive Domain
(Bloom's Taxonomy)

Knowledge • Defining terminology, symbols • Recalling facts, names, examples, rules, categories • Recognizing trends, causes, relationships • Acquiring principles, procedures, implications, theories *Key Term:* **remember**	**Analysis** • Recognizing assumptions, patterns • Deducing conclusions, hypotheses, points of view • Analyzing relationships, themes, evidence, causes and effects • Contrasting ideas, parts, arguments *Key Term:* **take apart**
Comprehension • Rephrasing definitions • Illustrating meanings • Interpreting relationships • Drawing conclusions • Demonstrating methods • Inferring implications • Predicting sequences *Key Term:* **understand**	**Synthesis** • Producing products, compositions • Proposing objectives, means, solutions • Organizing taxonomies, concepts, schemes, theories • Deriving relationships, abstractions, generalizations *Key Term:* **put together in a new way**
Application • Applying principles, rules, theories • Organizing procedures, conclusions, effects • Choosing situations, methods • Restructuring processes, generalizations, phenomena *Key Term:* **use**	**Evaluation** • Judging accuracy, consistency, reliability • Assessing errors, fallacies, predictions, means and ends • Considering efficiency, utility, standards • Contrasting alternatives, courses of action *Key Term:* **judgement based on criteria**

Source: Davis, G. A., & Rimm, S. B. (1998). Education of the gifted and talented (4th ed.). Boston: Allyn & Bacon, p. 227.

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 _____ 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	acquire	copy	define
describe	distinguish	identify	indicate
know	label	list	listen
locate	match	memorize	name
observe	practice	quote	read
recall	recite	recognize	rehearse
remember	repeat	reproduce	review
state	tabulate	trace	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	change	conclude	convert
demonstrate	describe	determine	diagram
differentiate	discuss	distinguish	draw
estimate	explain	express	extend
extrapolate	fill in	generalize	give in own words
give examples	illustrate	infer	interpolate
interpret	outline	paraphrase	predict
prepare	read	rearrange	relate
rename	reorder	rephrase	represent
restate	rewrite	separate	show
summarize	symbolize	tell	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	

<u>Compatible Products:</u>

blueprint	case study	chart	conclusion
categorization	characterization	cross-section	diagram
flow chart	graph	map	outline
questionnaire	report	seminar	story board
survey	Venn diagram		

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

<u>Representative Verbs:</u>

arrange anew	combine	compile	compose
constitute	construct	create	derive
design	devise	develop	forecast
formulate	generate	imagine	improve
integrate	invent	hypothesize	modify
originate	organize	plan	predict
prepare	prescribe	produce	propose
put together	rearrange	reconstruct	relate
reorganize	revise	simplify	synthesize
systemize	transmit	write	

<u>Compatible Products:</u>

art product	advertisement	audio tape	computer program
diorama	display	essay	film
formula	invention	joke	journal
machine	media projects	mural	new game
poem	political cartoon	prediction	project
solution	story	video tape	

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)

© Global Learning Communities,

Cooper & Boyd, 1993