



Instructional Design Theory

(Summary Notes by Jim Pellerin)

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Instructional Design Theory





Section 2

Content Structure and Organization

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Chapter 3

Teachers Should Not
Waste Time Writing
Behavioral Objectives

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Observations

- The performance most frequently required of students is to *remember*, while our intent is most often to have them *understand*.
- Test performance is shifted from memory to understanding when items that require a student to *remember* or *recognize* a definition are replaced by items that require the student to *use* the definition to identify specific instances of the phenomena being defined.
- Essay questions do not automatically assess understanding and are often less adequate than a true/false, multiple-choice, or short-answer format.



Chapter 4

Necessary Psychological Conditions for Defining Instructional Outcomes



3 components necessary to specify an instructional objective¹

- Behavioral performance
- Conditions under which this performance will be observed
 - Conditions related to a specific subject matter
 - General psychological conditions which help define the behavior being observed
- Criterion for acceptable performance

¹ Mager, 1962



Learned Behavior Categories

S—R

Emotional Behavior

continual, glandular,
involuntary, sub-conscious

S—R

Psychomotor

occasional, skeletal-
muscular, voluntary, little
conscious

S—R

Memorization

occasional, symbolic,
voluntary, conscious

S—R

Complex Cognitive

occasional, transfer,
voluntary, much conscious

Emotional (Signal Learning)		
Topographic (Stimulus Response) S=particular situation R=single skeletal-muscular	Chaining (Chaining) S=series response R=series of topographical	Complex Skill S=set of stimulus cues R=set of chains
Naming S=particular situation R=single symbolic	Serial Memory (Verbal Association) S=series response R=series of symbolic	Discrete Memory (Multiple Discrimination) S=set of symbolic cues R=set of verbal associations
Classification (Concept Learning) S=set of situations R=single transfer	Analysis (Principle Learning) S=series of concepts R=series of concepts (principles)	Problem Solving (Problem Solving) S=problem R=set of principles

single response

series of responses

set of responses

S=stimulus, R=response

Emotional Behavior

(Signal Learning)

- Description
 - In the presence of *every* stimulus situation, a student involuntarily reacts with physiological changes which he perceives as feelings
- Observable Behaviors
 - Approach and avoidance responses
- Psychological Condition
 - An *unrestrained* choice situation



Psychomotor Behavior

- Description
 - Occurs when a student is able to rapidly *execute*, without external prompting, a specified *neuro-muscular* reaction in the presence of a *specific* stimulus situation.
- Observable Behavior
 - An overt *skeletal-muscular* response which occurs in its entirety without hesitation
- Psychological Conditions
 - Presence of a *specific* cue and absence of prompts



Topographical Behavior

(Stimulus Response)

- Description
 - When a student is able to rapidly *execute*, without external prompting, a *single new neuro-muscular* reaction in the presence of a particular stimulus cue.
- Observable Behavior
 - New *muscular* movement or combination of movements (*single* reaction)
- Psychological Conditions
 - Presence of a *specific* cue and absence of prompts.



Chaining Behavior

(Chaining)

- Description
 - Occurs when a student is able to *execute*, without external prompting, a *coordinated series* of *muscular* reactions which occur in rapid succession in the presence of a *particular* stimulus cue.
- Observable Response
 - A *series* of *coordinated* responses.
- Psychological Conditions
 - Presence of a *specific* cue and absence of prompts. No *additional* prompts or cue in the middle of execution.



Complex Skilled Behavior

- Description
 - Occurs when a student is able to *sequentially execute*, without external prompting, *complex combinations of coordinated psychomotor chains*, each initiated in the presence of a particular cue, when a large *set of cues* are present.
- Observable Response
 - *A set of coordinated chains.*
- Psychological Conditions
 - Paced or unpaced presence of a *set of cues* and absence of prompts, prior to or during execution.



Memorization Behavior

- Description
 - Occurs when a student immediately *reproduces* or *recognizes*, without prompting, a *specific symbolic* response in the presence of a *specific* stimulus situation.
- Observable Behavior
 - The *reproduction* or *recognition* of a *symbolic* response.
- Psychological Conditions
 - Presence of a *specific* cue and absence of prompts



Naming Behavior

- Description
 - Occurs when a student immediately *reproduces* or *recognizes*, without prompting, a *single symbolic* response in the presence of a *specific* stimulus situation.
- Observable Behavior
 - The *reproduction* or *recognition* of a *single symbolic* response.
- Psychological Conditions
 - Presence of a *specific* cue and absence of prompts



Serial Memorization Behavior

(Verbal Association)

- Description
 - Occurs when a student immediately *reproduces* or *recognizes*, without prompting, a *series* of *symbolic* responses in the presence of a *specific* stimulus situation.
- Observable Behavior
 - The *reproduction* or *recognition* of a *series* of *symbolic* responses. The series is always the same.
- Psychological Conditions
 - Presence of a *specific* cue and absence of prompts.



Discrete Element Memorization Behavior (Multiple Discrimination)

- Description
 - Occurs when a student immediately *reproduces* or *recognizes*, without prompting, a *unique symbolic* response to *each* of a *set* of stimulus cues.
- Observable Behavior
 - The *reproduction* or *recognition* of a *unique symbolic* response to *each* of a *set* of stimulus cues.
- Psychological Conditions
 - Presence of a *set* of cues and absence of prompts.



Complex Cognitive Behavior

- Description
 - Occurs when a student makes an *appropriate* response to a *previously unencountered* instance of some *class* of stimulus objects, events or situations.
- Observable Behavior
 - The response to a *new* situation, not perceived as an instance of a particular class.
- Psychological Conditions
 - Presence of a *previously unencountered* instance of some *class* of stimulus.



Classification Behavior

(Concept Learning)

- Description
 - Occurs when a student is able to correctly identify the *class* membership of a *previously unencountered* object or event or a *previously unencountered* representation of some object or event.
- Observable Behavior
 - The student must make some kind of *class* identification.
- Psychological Conditions
 - The presentation of *previously unencountered* instances or non-instances.



Analysis Behavior (Principle Learning)

- Description
 - Occurs when a student is able to show the *relationship* between the component concepts in an *unencountered situation* in which a given *principle* is specified as relevant.
- Observable Behavior
 - The student must show the *relationship* between the *classes*.
- Psychological Conditions
 - The presentation of a *situation* which the student has not *previously analyzed* or seen analyzed. The *principle* (relationship) must be specified overtly or inferred.



Problem Solving Behavior

(Problem Solving)

- Description
 - Occurs when a student is able to *select relevant principles* and sequence them into an effective *solution strategy* when presented with an *unencountered* problem situation for which the relevant *principles* are *not* specified.
- Observable Behavior
 - *Selection of appropriate principles*, establishment of a *sequence, analysis* which requires classification.
- Psychological Conditions
 - *Unencountered* problem for which the *relevnt principles* are *not* specified



Push-down Principle

A behavior acquired at one level will be pushed down to a lower level as soon as conditions have changed sufficiently so that the learner is able to respond to the stimulus situation using lower level behavior





Observations

A given topic might be presented at several behavioral levels and by so doing the instruction may be improved.



Objective Writing Steps

1. Select the behavioral level by examining the subject matter for implied objectives.
2. Specify the appropriate psychological conditions.
3. State the objectives in terms of the necessarily psychological conditions.





Chapter 5

The Structure of Subject Matter and Its Instructional Design Implications

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Content Structures

- Learning Structures
- Procedural Structures
- Taxonomical Structures
- Theoretical Structures
- Non structures
 - Lists (no relation among their components)



Learning Structures

- *Learning-prerequisites* relations among the components of a subject matter
- Describes what must be known (what the learner must be *able* to do) before something else can be learned
- Often confuse *learner-prerequisite* relations with *procedural-prerequisite* relations.
- “A learner must know (be **able** to do) ‘X’ in order to learn (be **able** to do) ‘Y’.”



Procedural Structures

- Procedural relations among components
- *Procedural-prerequisite* relations
 - Relations among the steps of a *single* procedure (order)
 - What the performer *must* do before proceeding
 - “The performer must **do** (often confused with ‘be **able** to do’) ‘X’ before he can do ‘Y’.”
- *Procedural-decision* relations
 - Relations between *alternate* procedures
 - What factors are necessary
 - “Given condition ‘A’, the performer must do ‘X’ rather than ‘Y’ or ‘Z’.”



Taxonomical Structures

- Super-ordinate, co-ordinate and sub-ordinate relations among the *concepts* of a subject matter
- Most concepts can be divided into smaller concept classes (kinds)
- All concept classes have critical attributes (parts)
- Kinds – a concept is a variety of its super-ordinate concept
- Parts – sub-ordinate concepts are components of the concept
- Matrix structures – kinds-by-kinds, kinds-by-parts



Theoretical Structures

- Chains of causal relations among concepts
- Provide a meaningful understanding of the causes



***“Parts of”* Content Construct**

- Domain
 - One or more instances of one or more concepts
- Range
 - One or more instances of one or more concepts.
The results of an *operation* on a *domain*.
- Operation
 - A particular mapping between domain and range



“Types of” Operations

- *Identify* operation
 - *One-to-one* mapping between an instance of a *domain* concept and an instance of a *range* concept
- *Descriptive* operation
 - Instances of the *range* concept(s) are selected through *logical combinations* of instances of two or more *domain* concepts
- *Productive* operation
 - Instances of the *range* concept(s) are produced by composition, decomposition, or some other *change* operation, such that instances of two or more concepts are qualitatively changed as they are used to produce an instance of the range concept(s).



Rote-Meaningful Distinction

- Rote Content
 - Content that *can* be learned rotely at the use level
 - Subsets, steps
- Meaningful Content
 - Content that *cannot* be learned rotely at the use level
 - Concepts, principles



Types of operations, after rote-meaningful distinction applied

- Identity – rote identity (facts)
- Inclusion – rote descriptive (subsets)
- Union/intersection – meaningful descriptive (concepts)
- Order – rote productive (steps)
- Causal – meaningful productive (principles)



Rote-meaningful distinction for *structures*

- No relation (lists) – rote identity
- Ordinate relation (taxonomies) – rote descriptive
- Learning-prerequisite (learning hierarchies) – meaningful descriptive
- Procedural-prerequisite (procedural hierarchies) – rote productive
- Causal (theories) – meaningful productive



Construct / Structure Concepts

		Construct		Structure	
		Operation	Construct	Relation	Structure
Identity	Rote	Identity	Fact	Arbitrary	List
Descriptive	Rote	Inclusion	Subset	super / co / sub ordinate	Taxonomy
	Meaningful	Union / Intersection	Concept	Learning prerequisite	Learning Hierarchy
Productive	Rote	Order	Step	Procedural prerequisite	Procedural Hierarchy
	Meaningful	Causal	Principle	Causal	Theory / Model



Observations

- Classification of constructs will be useful for prescribing presentation strategies
- Classifications of structures will be useful for prescribing structural strategies
- All subject matter areas are comprised of ALL of the different kinds of structures. (not all may be relevant to the particular goal of the course)
- More than one kind of content structure is relevant





Chapter 6

The Elaboration Theory of Instruction

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Sequencing, synthesizing and summarizing (S³)

- Sequencing
 - The order to present topics
 - Influences the nature and stability of cognitive structures
- Synthesizing
 - The interrelationships among topics
 - Makes the parts more meaningful
- Summarizing
 - Previewing and reviewing topics taught
 - Influence retention



Some New Concepts

(roll mouse over term for definition)

- Content Construct
- Subject-Matter Structure
 - Orientation Structure
 - Supporting Structure
 - Multi-Structure
- Subject Matter Structure Types
 - Conceptual Structure
 - Procedural Structure
 - Theoretical Structure
 - Learning Structure



Strategy Components

- **Epitome**
 - Overview or advanced organizer, epitomizes the subject-matter content rather than summarizing it.
 - Boiling down the course content
 - Portrays only the most important aspects of the orientation structure
- **Elaboration**
 - Provides more detail or complex knowledge about the part
 - Primary-level elaboration elaborates on a part of the epitome
 - Secondary-level elaboration elaborates on the primary-elaboration and so on.



S³ Hypothesized Principles

1. INITIAL SYNTHESIS

An epitome should be presented at the very beginning of the instruction.

3. INTRODUCTORY FAMILIARIZATION

A "familiarize" (analogy) should be provided at the beginning of the epitome and at the beginning of each elaboration.

5. OPTIMAL SIZE

Each elaboration should be short enough that its constructs can be recognized comfortably by the student and synthesized comfortably by the instruction, yet long enough that it provides sufficient breadth of elaboration.

7. PERIODIC SUMMARY

To facilitate synthesis, a summarize should be provided before each synthesizer.

2. GRADUAL ELABORATION

Aspects of the epitome should be gradually elaborated so that the sequence of the instruction proceeds from general to detailed or from simple to complex.

4. "MOST IMPORTANT FIRST"

The most "important" aspect of the remaining orientation content should be elaborated on first. Importance is estimated on the basis of contributing to the student's understanding of the whole "picture."

6. PERIODIC SYNTHESIS

A synthesizer should be provided after each elaboration, in order to teach the relations among the more detailed constructs that were just taught and to show the context of the elaboration within the epitome.

8. TYPES OF SYNTHESIZERS

The right type of synthesizer should be used for each structure (conceptual, theoretical, and procedural).



The Elaboration Model of Instruction

- A prescriptive model (describe ways to achieve some end and therefore vary as goals vary)
- Describes ways to achieve *goals*
- Aspects of goals of instruction
 - The *general* goals, effectiveness, efficiency, and appeal, should *always* be maximized.
 - The *orientation* goals, conceptual, procedural, or theoretical, varies from course to course.



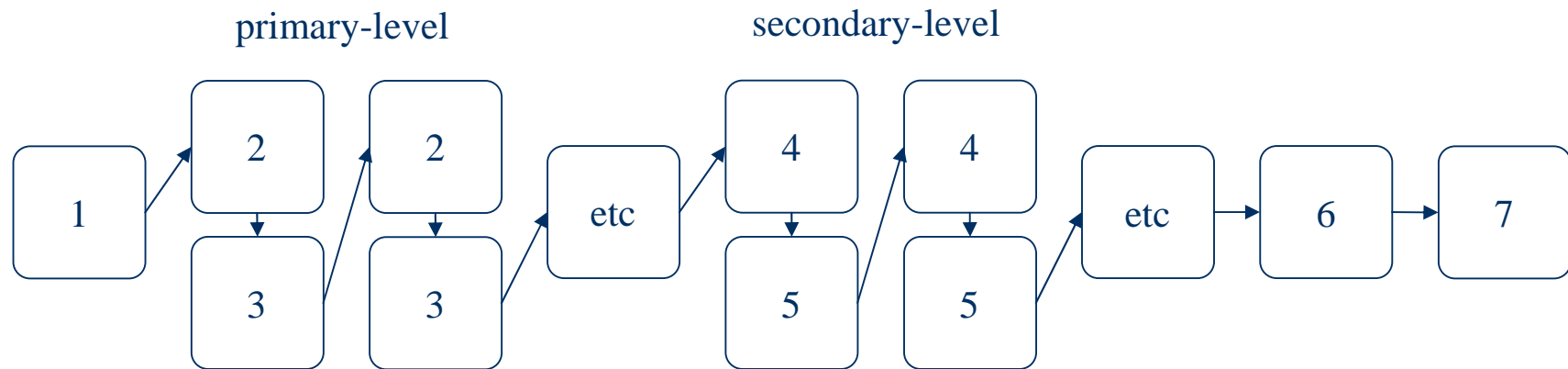
Elaboration Model Components

(diagram on following page)

1. Begins with an *epitome*
2. A *primary elaboration* for each aspect of the epitome
3. At the end of each primary-level elaboration, a *summarize* followed by an *expanded epitome*.
4. *Secondary-level elaborations* which elaborate on each primary-level elaboration.
5. At the end of each secondary-level elaboration, a *summarize* and *expanded epitome*.
6. Repeated for subsequent levels
7. A *terminal epitome* to synthesize the entire domain.



Epitome of the EMI



1. Epitome
2. Primary-level elaboration
3. Summarizer and expanded epitome
4. Secondary-level elaboration
5. Summarizer and expanded elaboration
6. Tertiary and quaternary levels, if required
7. Terminal summarizer and terminal epitome



Elaboration Model Variations

	Conceptual	Procedural	Theoretical
Epitome	s:general version i: concept, relations	s:created i: step, relations	s:general version or created i: construct, relations
Expanded Epitomes	Same as the Epitome but are extended to include more complexity or detail.		
Elaborations	topic: parts, kinds detail; breadth, depth	topic: step detail, alternate path detail: depth	topic: principle detail detail: depth
Internal Synthesizers	super/co/sub-ordinate relations	order relations	theoretical relations
Multi-Structures	The epitomes, elaborations, and synthesizers are usually based on a number of interrelated structures.		

s=synthesizer, i=instruction



Section 3

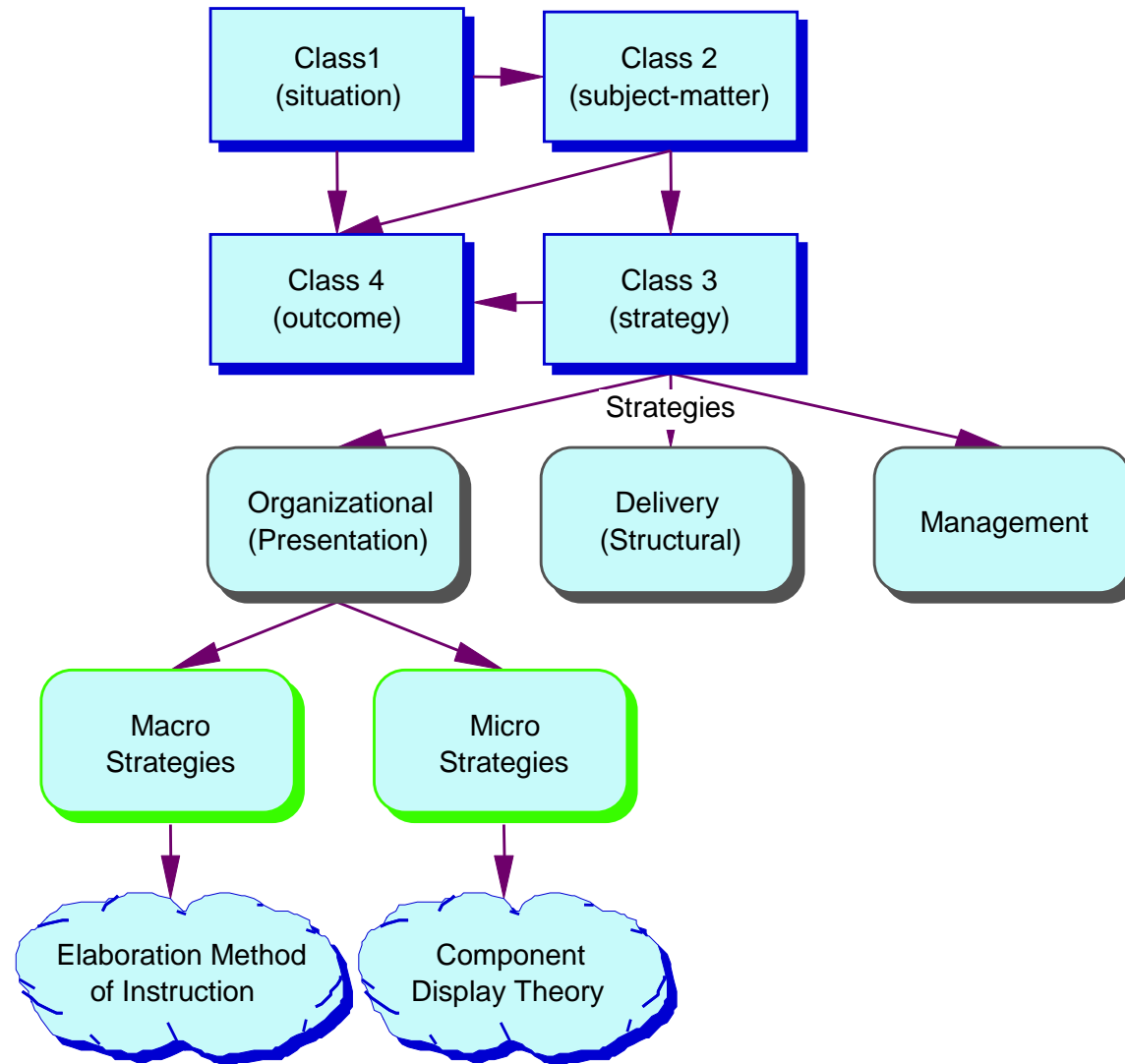
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CDT Strategy





Chapter 7

The Descriptive Component Display Theory

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Performance-Content Matrix

- **Student Performance**
 - Remember-Instance
 - Remember-Generality
 - Use
 - Find
- **Subject Matter Content**
 - Fact
 - Concept
 - Procedure
 - Principle



Student *Performance*

- Remember-Instance
 - A specific illustration (*example*) of an object, symbol, event, process, or procedure (search memory)
- Remember-Generality
 - A statement (*rule*) of a definition, principle, or the steps in a procedure (search memory).
- Use
 - To *apply* a generality to a specific case(s) (apply).
- Find
 - To *find* a new generality (derive or invent).



Subject Matter Content

- Fact
 - An *association* between a date and an event, or a name and a part. Pieces of information.
- Concept
 - A *set of objects*, events, or symbols with shared common characteristics.
- Procedure
 - An ordered *set of steps* for carrying out some activity.
- Principle
 - A *cause-and-effect relationship* in a process (explanations or predictions).



Performance Content Matrix for “use”

	CONDITIONS		BEHAVIOR		CRITERION	
	Variable 1	Fixed	Fixed	Variable 2	Fixed	Variable 3
Apply	Given:	Of/for:	Student will:	By:	With:	Shown by:
Use Concept	Drawings Pictures Descriptions	New Examples	Classify	Writing Selecting Pointing Scoring	Some Errors Short Delay	
Use Procedure	Word Materials Equipment Device	Name New task	Demonstrate	Manipulating Calculating Measuring Removing	Some Errors Timed or Un-timed	Check list
Use Principle	Word Descriptions Drawings Figures	Name New Problems	Explain or Predict	Predicting Calculating Drawing Graphing	Some Errors Un-timed	

Performance Content Matrix for “find”

	CONDITIONS		BEHAVIOR		CRITERION	
	Variable 1	Fixed	Fixed	Variable 2	Fixed	Variable 3
	Given:	Of/for:	Student will:	By:	With:	Shown
Derive or Invent						
Find Concept	Drawings Pictures Descriptions Diagrams Objects	Referents from unspecified categories	Invent Categories	Sorting and observing attributes Specifying attributes	Un-timed High correlating when others use concept	
Find Procedure	Description Demo Illustration Specification	Desired Product or Event	Derive Steps	Experiment Analysis Trial & Error	Un-timed Demo of Utility	
Find Principle	Description Illustration Observation	Event	Discover Relationship	Experiment Analysis Observation Demo	Un-timed Appropriate Research Design or Scholarship	

Performance Content Matrix for “remember”

Search Memory	CONDITIONS		BEHAVIOR		CRITERION	
	Variable 1	Fixed	Fixed	Variable 2	Fixed	Variable 3
	Given:	Of/for:	Student will:	By:	With:	Shown
Remember Fact	Drawings Pictures Diagrams Objects	A In any order	Recall B	Writing Drawing Pointing Circling	No Errors No Delay	1 point for each correct symbol in 10 sec
Remember Concept	Word Symbol	Name	State Definition	Writing Selecting Circling Checking	Few Errors Short Delay	1 each for each characteristic
Remember Procedure	Word Symbol Directions	Name	State Relationship	Writing Drawing Formula Graph	Few Errors Short Delay	1 error each step
Remember Principle	Word Symbol	Name	State Relationship	Writing Drawing Formula Graph	Few Errors Short Delay	1 error each relationship

Specifying Test Items

- Types of test items
 - True-false, multiple-choice, matching, short answer and essay
- An objective can be assessed by any form of test item
- Feedback should be delayed until after the test has been scored



Prompts

- Any information that enables the student to determine the correct response by other than the desired level of performance.
- Deliberate - intended to assist
- Inadvertent – through some other means, such as other test items
- All prompts should be avoided during the testing phase



Number of Items

- The number of items to *adequately* test an objective.
- Most tests have too few items for a single objective, making measurement of the objective unreliable.
- The more complex the situation, the more test items should be included.



More on Tests

- Divergence
 - Test items that are testing the same objective must vary from each other to the extent of the variations present for that objective.
- Difficulty
 - For each objective, test items should represent a range of difficulty from easy to hard
- Criterion
 - Varies according to the performance-content
 - **Remember** – *no errors* - *few errors*, **Use** – increase allowable errors to *some errors*, **Find** – demonstration that the new knowledge works



Types of Displays

- Primary Presentation Form
- Secondary Presentation Form
- Process Displays
- Procedural Displays



Primary Presentation Forms

- Content Mode
 - **Generality** – statements of definition (concept), procedure and principle
 - **Instance** – specific cases (a fact is always a specific case)
- Presentation Mode
 - **Expository** – to *present* tell, illustrate or show
 - **Inquisitory** – to *question*, ask, or require practice



Primary Presentation Forms

Content Mode	Generality	EG “Rule”	IG “Recall”
	Instance	Eeg “Example”	leg “practice”
		Expository	Inquisitory
Presentation Mode			



PPF Specifications (part 1)

	Presentation		Practice	
	EG	Eeg	leg	IG
FACT	no generality	Pairs A-B symbol-symbol object-symbol event-symbol	Name A-? symbol-? object-? event-?	no generality
CONCEPT	Definition <ul style="list-style-type: none"> •name •super-ordinate •attribute list •attribute values 	Example <ul style="list-style-type: none"> •name •object, event, symbol •all attributes 	Name, Classify <ul style="list-style-type: none"> •object, event, symbol •All attributes •name ? •Sort ? <u>FIND level</u> Explore categories <ul style="list-style-type: none"> •new objects, events, symbols •sort ? 	State Definition <ul style="list-style-type: none"> •name •paraphrase •definition ? <u>FIND level</u> Invent Definition <ul style="list-style-type: none"> •new definition ?

PPF Specifications (part 2)

	Presentation		Practice	
	EG	Eeg	leg	IG
PROCEDURE	Activity <ul style="list-style-type: none"> •goal – name •steps, conditions, loops •sequence 	Demonstration <ul style="list-style-type: none"> •goal – name •entity, tools •execution 	Demonstrate <ul style="list-style-type: none"> •goal •entity, tools •execution ? <u>FIND level</u> Explore procedures <ul style="list-style-type: none"> •goal •entity •find tools ? •find procedures ? 	State Steps <ul style="list-style-type: none"> •goal-name •paraphrase •activity ? <u>FIND level</u> Invent procedure <ul style="list-style-type: none"> •new activity ?
CONCEPT	Proposition <ul style="list-style-type: none"> •names •events •concepts •relationships 	Explanation <ul style="list-style-type: none"> •name •situation •execution 	Explain, Predict <ul style="list-style-type: none"> •name •situation •explain ?, predict? <u>FIND level</u> Explore problems <ul style="list-style-type: none"> •situations •find solutions ? 	State Relationship <ul style="list-style-type: none"> •name •paraphrase •proposition ? <u>FIND level</u> Discover principle <ul style="list-style-type: none"> •new proposition ?

Expository Presentations

- *Frame* is passive concept associated with page turning
- An *instructional transaction* is a dynamic interaction between the program and the student in which there is an interchange of information
- Instruction should promote and guide active mental processing
- The amount learned and retained is a function of relative cognitive processing



Conversational Programming

More effective presentations.....
will use *rhetorical questions* to.....
make the student think!....
involve the student in a mental dialog!...
and
cause the student to recall what is
already known.



Interactive Demonstrations

- Allows the student to manipulate the objects
- Provides the experiential base
- More effective than merely solving the problem
- Active involvement of the student
- Explore correct and incorrect strategies
- Exploration alone may not be sufficient. May require a series of suggested experiments.



Experiential Environments

(Microworld)

- Allows a student to explore concepts
- Expository presentation of a large number of examples
- Exploration alone may not be sufficient – may require suggested experiments



Inquisitory Presentations

- Allow the student to engage in a task or a representation of the task which is similar to what is being taught (practice).
- The student should receive feedback concerning the adequacy of performance
- What will the student be required to do?
- How can we allow the student to do this activity with feedback?
- Resembles the activity which enables the student to **do** the task, rather than to merely answer questions about the task.



Inquisitory Examples

- Editing
- Computation
- Assembly
- Panel and Equipment Operation
- Error Detection
- Hypothesis Testing and Predicting



Observations

- The amount and quality of the resultant learning is a direct function of the student's appropriate cognitive processing of relevant information.
- Passive presentation does little to promote the necessary mental activity
- Rhetorical questions, attention focusing information, experiential environments do much to increase the mental processing and level of learning
- Expository does not mean passive
- Carefully orchestrated transactions provide better instruction than passive book-like presentations.



Secondary Presentation Forms

- Information added to the PPF to enhance the learning
- Promote an increment in the achievement and learning efficiency of students participating



Expository General (EG) SPF

- EG'p – *prerequisite information* – information related to the concepts comprising the generality
- EG'c – *contextual* presentations – historical background
- EG'mn – *mnemonic* presentations – memory aids
- EG'h – *attention focusing (help)* – devices such as arrows, color, numbering, exploded drawings, graphics, boldface type
- EG'r – *alternative representation* – some other way to present the generality – chart, diagram, formula or even other words



Expository Instance (Eeg) SPF

- Eeg'h – *attention focusing (help)* – information to relate the instance to the generality
- Eeg'c – *context* - asides of interest, embedding the instance in a story
- Eeg'r – *alternative representation* – the same instance uses more than one format



Inquisitory Instance (leg) SPF

- leg'FBca – *feedback correct answer*
- leg'FBrw – *feedback right or wrong*
- leg'FBh – *feedback help* – a complete reworking of the problem
- leg'h – *attention focusing* – facilitate the student answering the question
- leg'c – *contextual* – a story problem
- leg'r – *alternative representations* – see a problem in different formats



Inquisitory General (IG) SPF

- IG'FBca – *feedback correct answer* – correct statement of the generality
- IG'FBu – *feedback use*
- IG'FBh – *feedback help* – a complete reworking of the problem
- IG'r – *alternative representations* – graph or picture
- IG'h – *helped generalities* – application of the generality to a specific example
- IG'c – *contextual* – historical information, prerequisite information, and information about the importance of the relationship



Process Displays

- Instructions or Directions
- Suggestions on how to think about or how to process the information that is presented.
- Examples
 - “Close your eyes and try to....”
 - “Think back over.....”



Procedural Displays

- Directions to the student indicating how to operate the equipment being used to present the material.
- Examples
 - “Turn the page now”
 - “Turn on the recorder”



Interdisplay Relationships (Part 1)

- **Divergent** – critical *characteristics* of subsequent instances should be as different from each other as possible.
- **Range** – wide range of *difficulty* represented by the instances. Don't over-generalize or under-generalize.
- **Matching** – select non-examples that enhance the student's ability to *discriminate* among *characteristics* that are *relevant* and those that are NOT *relevant*.
- **Isolation** – primary presentation should be clearly *separated* and *identified* by some graphic or auditory



Interdisplay Relationships (Part 2)

- **Fading** – information gradually *replaced* by directions to increase the level of mental processing
- **Chunking** – *group* information into mind-sized chunks (seven or fewer ideas)
- **Random Order** – present items in random order, if order is *not relevant*
- **Sequence** – the *order* in which chunks of information is presented will affect learning if order *is relevant* (procedure steps, process events).



Interdisplay Relationships (Part 3)

- **Criterion** – the *accuracy* of learner's responses in practice or testing, Varies depending on objective.
- **Response Delay** – the *time* a learner responds to a situation. Varies depending on objective.
- **Learner Control** – whether the system or the learner makes *decisions* about the learning.
- **Number of Items** – Number of instances necessary for *adequate* instruction. More complex information requires more instances.

