

APPENDIX EIGHT

EXAMPLES OF COMPLETE CONCEPT ANALYSIS

General Considerations

A complete, formal analysis of a concept is a time-consuming procedure which is best reserved for key concepts, those which provide the basic structure or framework for a more extensive sequence of instruction.

A less formal analysis also is possible. Typically, student difficulties with concepts being taught are revealed by in-class comments and reactions to the instruction. These "error signals" can expose common problems the students are experiencing, specific overgeneralization and undergeneralization, and the appropriate remedial steps can be taken.

Components of a Formal Analysis

The complete analysis of a concept prepared to guide instructional planning and evaluation will have the following components:

1. The concept "label" and, on occasion, a mention of its superordinate class,
2. a list of mutually-exclusive critical attributes,
3. a list of variable attributes with "exhaustive" dimensions for each,
4. a minimum rational set of teaching examples with dimensions of each variable attribute "sufficiently" varied across the set,
5. a minimum rational set of close-in nonexamples "demonstrating" the absence of each critical attribute for use when teaching,
6. a "new" minimum rational set of examples reserved for testing,
7. a "new" minimum rational set of close-in nonexamples reserved for testing, and
8. a rationale expressed for each example and nonexample indicating the basis for including that specimen in its set.

Model Concept Analyses

The examples included in this appendix are "model" analyses. Each analysis carefully observes the procedural guidelines set forth in Chapter 5, including all of the components of a complete formal analysis listed above. The examples include analyses of single concepts and joint analysis of coordinate concepts.

The complete analysis of a concept which is valid for the design of instruction and evaluation requires an analyst to have mastered both the analysis procedures and the subject matter content. For the most part, the analyses included in this appendix have been prepared by individuals rather than by a team of subject matter specialists. As such, they tend to represent one person's opinion regarding subject matter issues. You may find that you disagree with those opinions represented in an analysis. As we have sought to illustrate the procedures applied to some rather sophisticated concepts, that type of disagreement can be anticipated and, at best, is a good sign. However, we ask that you appreciate the intent of these examples, which is to illustrate for you the optimum application of the procedures of concept analysis itself. Given that frame of reference, we welcome any subject matter comments you may wish to share with us.

MODEL CONCEPT ANALYSIS

Literature Concept: BiographyCritical Attributes

- | | |
|--|---|
| 1. A history of a single person | 2. Moral purpose of the book (if any)
a) didactic
b) non-didactic |
| 2. Written by someone other than the subject | 3. Author's attitude toward subject
a) positive
b) neutral
c) negative |
| 3. Written in prose | |
| 4. Non-fiction | 4. Method of author
a) objective
b) non-objective |

Variable Attributes

- | | |
|--|---|
| 1. Final published form:
a) entire book
b) section of a book | 5. Depth of study
a) covers external events of subject's life
b) throws some light on subject's inner state
c) attempts to penetrate psychology of subject |
|--|---|

Teaching ExamplesRationale

- | | |
|---|-----------------|
| 1. <u>The Life of Samuel Johnson</u> , by Boswell | 1a, 2b, 3a, 4a, |
| 2. "Robert A. Taft" in <u>Profiles in Courage</u> , by Kennedy | 1b, 2a, 3b, 4a, |
| 3. "The End of General Gordon" in <u>Eminent Victorians</u> , by Strachey | 1b, 2a, 3c, 4b |

Teaching Non-Examples

(Analyst's complete basis for rationale is included)

- | | |
|--|---------|
| 1. <u>Lives of the Poets</u> , by Johnson. A collection of biographies written by someone other than the subject(s); in prose; non-fiction; but not the history of a single person. | lacks 1 |
| 2. <u>The Autobiography</u> , by Franklin. The story of Franklin's life is the history of a single person; in prose; non-fiction; but is not written by someone other than the subject. | lacks 2 |
| 3. "To the Memory of My Beloved Master William Shakespeare", by Johnson. It is about the history of a single person; written by someone other than the subject; nonfiction; but is not written in prose. | lacks 3 |
| 4. <u>The Convert</u> , by Warner. Story of the life and conversion of St. Augustine is a history of a single person; written by someone other than the subject; in prose; but is not non-fiction. | lacks 4 |

Testing Examples

- | | |
|--|--------------------|
| 1. <u>The Ordeal of Mark Twain</u> , by Brooks. | 1a, 2b, 3b, 4a, 5c |
| 2. "Theodore Roosevelt: The Conservative as Progressive" in <u>The American Political Tradition</u> , by Hofstadter. | 1b, 2b, 3c, 4a, 5b |
| 3. <u>Life of Sir Thomas More</u> , by Roper. | 1a, 2a, 3a, 4b, 5a |

Testing Non-Examples

- | | |
|--|---------|
| 1. <u>The Decline and Fall of the Roman Empire</u> , by Gibbon | lacks |
| 2. <u>Across Spoon River</u> , by Masters | lacks |
| 3. "In Memoriam A.H.H." by Tennyson | lacks 3 |
| 4. <u>God's Angry Man</u> , by Ehrlich | lacks 4 |

MODEL CONCEPT ANALYSIS

Art Concept: Van Gogh's styleCritical Attributes

1. Forms are darkly outlined.
2. Colors used are intense in tone.
3. Brush strokes are energized.

Variable Attributes

1. Subject Matter
 - a) Portrait
 - b) Landscape
 - c) Still Life
2. Color Schemes
 - a) Cool Colors
 - b) Warm Colors

Teaching Examples

<u>Portrait of Dr. Gachet</u>	1a, 2a
<u>Wheatfield with Crows</u>	1b, 2b
<u>Vase with Sunflowers</u>	1c, 2b
<u>Chestnut Blossoms</u>	1c, 2a

Teaching Non-Examples

George Seurat: <u>A Sunday Afternoon on the Island of Grande Jatte</u>	lacks 1
Paul Cezanne: <u>Portrait of a Man</u>	lacks 2
Paul Gauguin: <u>The vision after the Sermon</u>	lacks 3

Testing Examples

<u>Portrait of Pere Tanguy</u>	1a, 2b
<u>Gauguin's Chair</u>	1c, 2a
<u>Boats at Saintes Maries</u>	1b, 2a
<u>Two Cypreses</u>	1b, 2b

Testing NonExamples

Claude Monet: <u>Water Lillies</u>	lacks 1
Oscar Kokoschka: <u>The Tempest</u>	lacks 2
Henri Rosseau: <u>The Dream</u>	lacks 3

German Concept: Subordinating ConjunctionCritical Attributes

- An uninflected word which:
1. Identifies a logical relationship within a sentence
 2. Combines dependent clauses with main clause
2. May refer to:
 - a) Time
 - b) Place
 - c) Cause
 - d) Purpose
 - e) Manner
 3. Following dependent clause includes:
 - a) a finite verb
 - b) an infinitive

Variable Attributes

1. Relative location:
 - a) begins a sentence
 - b) appears within a sentence

Teaching Examples

1. Er hat gesagt, dass er mitkommen wollte. 1b,2d,3a
He said, that he wanted to come along.
2. Ich habe nicht geschrieben, weil ich krank war. 1b,2c,3a
I did not write, because I was sick.
3. Nachdem er die Hausarbeit machte, ging er ins Bett. 1a,2a,3a
After he did the homework, he went to bed.
4. Er tät, als ob er nicht mitkommen wollte. 1b,2e,3a
He acted, as if he did not want to come along.
5. Ich schreibe, um Dir wieder mal zu danken. 1b,2d,3b
I'm writing, in order to thank you once again.
6. Woher er kommt, sagt er keinem Menschen. 1a,2b,3a
Where he comes from, he doesn't tell anyone.

Teaching Nonexamples

1. Ich habe dreimal angerufen, aber niemand war zu Hause. lacks 2
I called three times, but nobody was at home.
2. Der Mann, den ich gestern kennenlernte, heisst Mueller. lacks 1
The man, whom I met yesterday, is called Mueller.

Testing Examples

- | | |
|--|------------|
| 1. <u>Sobald</u> ich das Geld verdienen kann, fahre ich wieder nach Deutschland.
<u>As soon as</u> I can earn the money, I'm going back to Germany. | 1a, 2a, 3a |
| 2. In der Schweiz gibt es Berge, <u>soweit</u> man sehen kann.
In Switzerland there are mountains, <u>as far as</u> one can see. | 1b, 2b, 3a |
| 3. <u>Wenn</u> Du nichts dagegen hast, komme ich morgen nicht.
<u>If</u> you don't mind, I'm not coming tomorrow. | 1a, 2c, 3a |
| 4. <u>Ohne</u> seiner Frau etwas gesagt zu haben, ist er plötzlich weggegangen.
<u>Without</u> having said anything to his wife, he suddenly went away. | 1a, 2d, 3b |
| 5. Er hat angerufen, <u>anstatt</u> einen Brief zu schreiben.
He telephoned, <u>instead</u> of writing a letter. | 1b, 2e, 3b |

Testing Nonexamples

- | | |
|--|---------|
| 1. Ich habe <u>während</u> der Stunde geschlafen.
I slept <u>during</u> class. | lacks 2 |
| 2. Kennst Du die Frau, <u>die</u> das Buch geschrieben hat?
Do you know the lady <u>who</u> wrote the book? | lacks 1 |

MODEL CONCEPT ANALYSIS

Biology Concept: BacteriaCritical Attributes

1. Unicellular
2. Indistinct nuclei

Variable Attributes

1. Shape
 - a) spherical
 - b) rod-like
 - c) spiral

Teaching Examples

- | | |
|-------------------------|------------|
| 1. Streptococcus lactis | 1a, 2c, 3b |
| 2. Treponema pallidum | 1c, 2a, 3b |
| 3. Pneumococcus | 1a, 2b, 3b |
| 4. Leuconostoe | 1a, 2c, 3b |
| 5. Sarcina | 1a, 2d, 3a |

Testing Examples

- | | |
|-----------------------|------------|
| 1. E. coli | 1b, 2a, 3b |
| 2. Micrococcus | 1a, 2a, 3b |
| 3. Spirillum volutons | 1c, 2a, 3b |
| 4. Zymosarcina | 1a, 2d, 3b |
| 5. Sporosarcina | 1a, 2d, 3a |

2. Grouping
 - a) singly
 - b) pairs
 - c) chainlike aggregates
 - d) grapelike clusters

3. Type:
 - a) aerobic
 - b) anaerobic

Teaching Nonexamples

- | | |
|---------------|---------|
| 1. Paramecium | lacks 2 |
| 2. Nostoc* | lacks 1 |

Testing Nonexamples

- | | |
|-----------------|---------|
| 1. Euglena | lacks 2 |
| 2. Arthrospira* | lacks 1 |

*a filamentous blue-green algae

Physics Concept: Electromagnetic RadiationCritical Attributes

1. Wave motion
2. Constant speed

Teaching Examples

- | | |
|----------------|----|
| 1. Gamma rays | 1a |
| 2. Blue light | 1b |
| 3. Radio waves | 1c |

Testing Examples

- | | |
|---------------|----|
| 1. X-rays | 1a |
| 2. Red light | 1b |
| 3. Microwaves | 1c |

Variable Attributes

1. Wavelength
 - a) Short
 - b) Medium
 - c) Long

Teaching Nonexamples

- | | |
|-----------|---------|
| 1. Photon | lacks 1 |
| 2. Sound | lacks 2 |

Testing Nonexamples

- | | |
|---------------|---------|
| 1. Neutrino | lacks 1 |
| 2. Water wave | lacks 2 |

MODEL CONCEPT ANALYSIS

Linguistic Concept: Morpheme

A morpheme is a linguistic unit which:

Critical Attributes

1. carries a stable meaning from one construction to another, and *
 2. contributes that meaning to the construction in which it appears, and
 3. cannot be further subdivided into units having meanings related to that construction.
3. Frequency of construction (Thorndike-Lorge Word List)
 - a) occurs at least once in one million words
 - b) occurs less than once in one million but at least once in four million
 - c) occurs less than once in four million but at least four times in eighteen million
 - d) occurrence to rare to be listed**

Variable Attributes

1. Type of morpheme
 - a) free
 - b) bound
 - c) null
2. Syllabic length
 - a) less than one syllable
 - b) one syllable
 - c) two syllables
 - d) more than two syllables
4. Type of remainder
 - a) free
 - b) bound
 - c) none
 - d) both free and bound elements
5. Location in construction
 - a) base
 - b) prefix
 - c) suffix
 - d) infix**
 - e) superfix**

Minimum Rational Set of Examples

- | | |
|----------------------------|--------------------|
| 1. <u>bawd</u> 's | 1b, 2a, 3c, 4a, 5c |
| 2. <u>dog</u> -tired | 1a, 2b, 3c, 4d, 5a |
| 3. <u>incontrovertible</u> | 1b, 2c, 3b, 4b, 5b |
| 4. <u>elephant</u> | 1a, 2d, 3a, 4c, 5a |

Minimum Rational Set of Nonexamples

- | | |
|--|----------|
| 1. <u>re</u> in <u>reify</u> and <u>redo</u> | lacks 1* |
| 2. <u>cat</u> in <u>catsup</u> | lacks 2 |
| 3. <u>activ</u> in <u>activate</u> | lacks 3 |

Only one set of examples and one of nonexamples are presented here. A complete analysis would present both a teaching and a testing set; however, the two sets above illustrate the characteristics of the minimum sets of each. The possibilities of examples and nonexamples of the concept are practically limitless, thus additional sets could be developed.

*lack of critical attribute #1 is only apparent when two different morphemes are presented at once.

**The analysis and sets of examples here illustrate a curriculum decision; namely, some attribute dimensions are judged to be more appropriate for an advanced course. These dimensions are not illustrated in the range of examples.

MODEL OF A JOINT ANALYSIS OF A SET OF COORDINATE CONCEPTS

VALUES OF CRITICAL ATTRIBUTES OF THE COORDINATES

How the Stimulus is Perceived:	Direction of Change of Stimulus:	
	Onset (turned on)	Offset (turned off)
Attractive	Positive Reinforcement	Negative Punishment
Aversive	Positive Punishment	Negative Reinforcement

VARIABLE ATTRIBUTES OF THE COORDINATES

1. Age relationship between agent and recipient:
 - a) Both adult
 - b) Both child
 - c) Adult-child
 - d) Not applicable
2. Role relationship between agent and recipient:
 - a) One a socially-defined authority figure
 - b) Family
 - c) None
3. Status relationship between agent and recipient:
 - a) Agent and recipient equal
 - b) Agent and recipient unequal
 - c) Indeterminate
4. Nature of the event:
 - a) Physical-tangible
 - b) Verbal-social

The set of teaching and testing examples for this joint analysis has not been included in this model due to its length. You should note, however, that an example of any one of these four coordinate concepts is at the same time a close-in nonexample of each of the other three. Thus, it is correct to speak of teaching these coordinates with "examples" of all four, that is, without deliberate reference to nonexamples — although the required nonexamples are being used.