Competency Based Education

Competency based education is a systematic approach to the design of instruction that is characterized by the identification of predetermined competencies that are shared with students in the form of observable and measurable learning objectives. Instructional strategies and techniques are used that are appropriate to the cognitive level of the predetermined competencies. Assessment occurs through test items that are matched to specific objectives in terms of content and cognitive level. Student evaluations are based upon each student's achievement of predetermined competency levels rather than on a comparison to the performance of other students.

Basic Tenets:

The basic tenets of competency based education are:

A. Specific competencies and required performance levels are identified prior instruction.
These competencies clearly describe the knowledge, skills and attitudes students are expected to demonstrate at the conclusion of instruction. Stated competencies for university parallel programs are determined by faculty members based upon their knowledge of the discipline and requirements four-year receiving institutions. Associate in Applied Science competencies are, generally, determined by faculty members based upon their knowledge of the profession and input from program advisory committees.

B. Competencies are shared with students in the form of objectives that are stated in observable and measurable terms.
"Observable terms" means the student will be required to do something that the instructor can observe and will demonstrate his or her mastery of that competency. It is not possible, for example, for an instructor to know that a student "understands" something unless the student does something that the instructor can observe and measure.

C. Instructional strategies are appropriate to stated objectives and the cognitive level at which students are expected to perform.
If students are, for example, expected to think critically when assessed, instructional strategies should be applied that teach, require, and provide practice in thinking critically using the knowledge and/or skills gained through instruction. Using teaching techniques that only require students to memorize facts and knowledge are not appropriate when they will be required to apply the knowledge and skills during assessment in a manner that requires critical thinking.

D. Objectives and test items are correlated in terms of content and cognitive level.

The content measured in test items must be the content specified in the stated objectives. Humans can function at various cognitive levels ranging from memorizing to thinking critically. It is critical that students be assessed at the cognitive level specified in the stated objectives.

E. Evaluation is criterion-referenced rather than norm-referenced.

"Criterion-referenced" means that students are measured by pre-determined standards. Minimum standards of performance are established for each possible grade and students receive grades based upon their level of performance or "mastery of the competencies." How well or how poorly other students in the class perform has no bearing on the grade each student receives. "Norm-referenced" assessment means a grade received by any given student is determined by how he or she performed the competencies in relation to how well or poorly other students performed. Grading on a curve or the Bell Shaped Curve is an example of norm-referenced grading.

The objective in Competency Based Education approach is to measure if and to what level students achieved the stated objectives. NOT to measure how well one student performed in comparison to other students.

NOTE: In the early days of OKCCC, the instructional philosophy was "competency based education using Mastery Learning Principles." While Mastery Learning principles can be used in a competency based education environment, they are not one of the basic tenets of Competency Based Education. CBE establishes specific competencies and required performance levels but does not inherently make any accommodations for variations in student learning rates. Mastery Learning principles make an attempt to accommodate variations in student learning rates. This is generally accomplished through recycling activities and retesting procedures.

SUMMARY OF

BLOOM'S COGNITIVE TAXONOMY

- **Knowledge**
- **Comprehension**
- **Application**
- **Analysis**
- **Synthesis**
- **Evaluation**

KNOWLEDGE

The ability to memorize, recall, or otherwise repeat information presented earlier.

- Knows common terms
- Knows specific facts
- Knows methods and procedures
- Knows basic concepts
- Knows principles

Examples of behavioral terms (action verbs)

- Define
- Identify
- Label
- Lists
- Match
- Select
- State
- Name
- Recognize
- Repeat

Sample learning objectives

- Given a diagram of a twin head copy router, label each of the main parts.
- List the five safety rules to be observed in a chemistry lab.

- Identify the year in which California passed New York as the most populous state.
- Define the terms heat and temperature.

COMPREHENSION

The ability to interpret or restate the information acquired at the knowledge level.

- Understands facts and principles
- Interprets verbal material
- Interprets charts and graphs
- Translates verbal material to mathematical formulas

Examples of behavioral terms (action verbs)

- Convert
- Distinguish
- Explain
- Summarize
- Paraphrase
- Generalize
- Give examples
- Estimate

Sample learning objectives

- Given a temperature reading in either F, C, or A, convert the reading to either of the other two.
- Differentiate between relative values expressed in fractions.
- Describe the work of Mother Teresa.
- Explain how a camera lens works.
- Using your own words, define pre-cognition.

APPLICATION

The ability to use or apply information, theories, principles, or laws to new situations.

- Apply concepts and principles to new situations
- Apply laws and theories to practical solutions
- Solve mathematical problems
- Demonstrate correct usage of a method or procedure
- Construct charts and graphs

Examples of behavioral terms (action verbs)

- Produce

- Operate
- Solve
- Demonstrate
- Relate
- Use
- Modify
- Compute
- Prepare

Sample learning objectives

- Given the initial and final temperatures of a known quantity of water, calculate the amount of heat gained or lost.
- Calculate the flow of current in specific household appliances, given their voltage and power ratings.
- Demonstrate the ability to safely and efficiently operate a drill press.
- Given the names of the reactants and the products of a chemical reaction, construct a balanced molecular equation.
- Given characteristics of an individual in respiratory distress, describe the proper treatment protocol.

ANALYSIS

The ability to divide complex knowledge into its separate parts and recognize the relationships of those parts.

- Recognize unstated assumptions
- Recognize logical fallacies in reasoning
- Evaluate the relevancy of data
- Distinguish between facts and inferences
- Explain expected consequences
- Analyze the organizational structure of a physical thing or work (art, music, writing)

Examples of behavioral terms (action verbs)

- Discriminate
- Infer
- Differentiate
- Diagram
- Subdivide
- Relate
- Point out
- Explain

Sample learning objectives

- Given a emergency medical emergency, the student will determine the most appropriate protocol.
- After reading a three-paragraph essay, the student will identify the thesis statement and each topic sentence and describe how each supports the meaning of the essay.
- Given pertinent facts about a building's structure, describe what is most likely to happen when…..
- Given statements related to American history, distinguish those that are fact and those that are an express an opinion.
- Given the schematic of a piece of electronic equipment, determine the cause of its malfunction and perform appropriate repair procedures.

SYNTHESIS

The ability to bring together separate elements of knowledge to form new patterns or wholes.

- Writes a well organized theme
- Gives a well organized speech
- Writes a creative short story, poem, musical piece, etc.
- Proposes a plan for an experiment
- Integrates learning from different areas into a plan for solving a problem
- Formulates a new scheme for classifying objects, events, ideas, etc.
- Integrates learning from one or different areas to create a procedure or build a new physical object.

Examples of behavioral terms (action verbs)

- Rearrange
- Generate
- Create
- Compose
- Combine
- Devise
- Design
- Modify
- Organize

Sample learning objectives

- The student will be able to compose an original piece of music in 4/4 time.
- Given a set of specifications, the student will design a pump for use on an irrigation system.

- Given all pertinent facts about a city, the student will create an appropriate mass transit system for that city.

EVALUATION

The ability to make judgments or appraisals based on knowledge or given criteria. Criteria used to make a judgment or appraisal may be external or internal.

- Judges the logical consistency of written material.
- Judges the adequacy with which conclusions are supported by data.
- Judges the value or quality of a work by using of internal criteria.
- Judges the value or quality of something using external standards of excellence.

Examples of behavioral terms (action verbs)

- Appraise
- Conclude
- Criticize
- Justify
- Support
- Interpret
- Contrast
- Discriminate

Sample learning objectives

- Given a piece of doggerel verse and a number of lines from Wordsworth's "Ode on Intimations of Immorality," the student will select that which she believes is the better poem. She will make criteria evident and defend her choice.
- Explain how businessmen, farmers, urban laborers and politicians responded to economic hard times during the Great Depression and state, in your opinion, which group was injured most during the Great Depression and justify your opinion.
- Given a list of six possible solutions to the problem of overpopulation, the student will select the three which she believes to be the most desirable and defend her choices.
- When presented with an emergency medical scenario in which two different protocols may be appropriate, the student will select the on he believes is most appropriate and defend his choice.

AN EXAMPLE OF HOW OBJECTIVES CAN BE WRITTEN AT VARIOUS COGNITIVE LEVELS USING THE SAME CORE KNOWLEDGE

Knowledge

List the eight principles of web page design.

Comprehension

Describe, in your own words, each of the eight principles of web page design.

Application

Given a sample web page, suggest ways in which it could be modified and still maintain its effectiveness.

Analysis

Given two web pages, compare the way in which the designers varied the use of each of the eight principles of web page design.

Synthesis

Design a web page that incorporates each of the eight web page design principles.

Evaluation

Using the eight principles of web page design, assess the quality of given web pages and justify your opinions.

Verbs applicable to the various levels in the cognitive domain. NOTE: Depending on their use, some verbs may apply to more than one level.

1. Knowledge

arrange
define
duplicate
label
list
memorize
reproduce
order
recognize
relate
recall
repeat
name
memorize

2. Comprehension

classify
describe
recognize
explain
express
identify
indicate
translate
locate
report
discuss
restate
review
select
tell

3. Application

apply
choose
demonstrate
dramatize
employ
illustrate
interpret
operate
practice
schedule
sketch
solve
use

4. Analysis

analyze
appraise
calculate
categorize
compare
contrast
criticize
diagram
differentiate
discriminate
distinguish
examine
experiment
inventory
question
test

5. Synthesis

arrange
assemble
collect
compose
construct
create
design
write
formulate
manage
organize
plan
prepare
propose
set-up

6. Evaluation

appraise
argue
assess
attach
choose
compare
defend
estimate
judge
predict
rate
score
select
support
value
evaluate

Examples of Current Objectives and Course Competencies

These are a sample of the objectives and course competencies from various courses across the curriculum. I chose a few from several syllabi. Thanks to the faculty who have allowed me to use their work.

Genetics and Man—Bio 2343 (Dennis Anderson)
Unit Objectives
Given a single trait in two individuals, you will use a Punnett square to determine the possible genotypes and phenotypes of their offspring also give the probability of each.
Given data from genetic crosses, you will construct a genetic map to demonstrate the order of the genes on a chromosome and the relative distance between the genes.
Course Objectives
Upon completion of this course you should be able to do the following:
1. Apply the laws of genetics and probability to predict the chances of inheriting given traits.
2. Describe basic biological processes in the reproduction of DNA, cells, and the human body; the development and functioning of the immune system; and genetic abnormalities.
3. Discuss some of the social and ethical questions that have arisen as a result of contemporary genetic research.

News Writing I—JB 1133 (Sue Hinton)
Unit Objectives
After completing this unit, the student will be able to define libel and explain the three complete defenses and the main partial defense against libel suits.
Given a typed news story, the student will edit the copy, correcting all erros in spelling and wire service style.
After completing this unit, the student will write accurate, concise, and interesting news leads.
After completing this unit, the student will write straight news stories using the inverted pyramid structure to organize material in a descending order of importance, beginning with the most import facts first, progressing to the least important details last.

College Physics I—PHYS 1114 (Steve Kamm)
Given two of the three quantities, density, mass, and volume, determine the third quantity while maintaining the appropriate number of significant digits.
Construct a linear graph of paired data, and write an equation for the graph.
Apply the concept of torque to analyze the forces acting on a rigid body in equilibrim.
Use the Kinetic-Molecular Theory to describe the interplay between macroscopic and microscopic variables for gases.
Define the Heat of Combustion, and apply it to problems involving production of heat.