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ABSTRACT

Designed to assist community college instructors in the development of objectives for a course or program, this guidebook applies Bloom's Cognitive Taxonomy to the process of writing objectives. First, a short preface underscores the importance of instructional objectives in the design and delivery of education. Next, part I provides a pre-test on the taxonomy, allowing instructors to assess their understanding of the different levels of complexity of behavioral objectives. Then, part II examines Bloom's six levels of cognitive complexity (i.e., knowledge, comprehension, application, analysis, synthesis, and evaluation), offering an exercise for developing skill in writing objectives which correspond to each level. This section concludes with a mastery test on Bloom's levels of objectives in the cognitive domain, and a test scoring key. Finally, section III covers common pitfalls and problems in writing objectives, offering advice for producing objectives that direct students, rather than describe course content; that describe expected student performance; that are technically and clearly written; and that contain the instructor's evaluation criteria. Suggestions for further reading are included. (JMC)

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A Short Guide To The Writing Of Instructional Objectives —

TABLE OF CONTENTS

TABLE OF CONTENTS - continued

PREFACE

Instructional objectives have been studied for about the last fifty years. While a few instructors are continuing to debate their usefulness, it is widely accepted that instructional objectives are of central importance in the design and delivery of education. The recent surge in instructional technologies such as programmed instruction, computer-assisted instruction, and interactive video have increased the interest in the specification of effective objectives.

This guide represents an effort to meet the need for a concise reference that can be readily utilized by instructors when developing objectives for a course or program. Specifically, it is expected that the guide will assist in understanding Bloom's Cognitive Taxonomy and the application of the taxonomy to the process of writing objectives.

The guide is divided into three parts: Part I, is a pre-test on Bloom's Cognitive Taxonomy to give you some idea of where you are in terms of understanding the different levels of complexity of behavioural objectives. Part II, deals with the levels of complexity of objectives in Bloom's Cognitive Domain, with exercises for developing skill in writing behavioural objectives for each of the six levels of complexity. Part III, covers the fine points of writing instructional objectives, such as developing clear, concise objectives that let the student know what is expected, in the simplest and shortest manner possible.

The authors express their appreciation to a number of people. First, to the University of Victoria students in our Educational Psychology classes who used the guide and made a number of recommendations for

improvement. We also express our sincere thanks to Lillian Thom for her excellent work on typing, proofreading and layout, and to Diane Jacobs for her beautiful work on the cover design.

Duane O. Ruhadeau

Bill Garrett

August, 1983

PART I

PRETEST

PART I

PRETEST

What is Bloom's Taxonomy and why do I want to take this test?

As mentioned in the preface, the framework for preparing objectives has two dimensions-content and cognitive complexity. Decisions about content are not part of this guide as these decisions are usually made by individuals directly responsible for a program or specific course. This guide will help you to identify and label the level of cognitive complexity for any objective and word the objective in a fashion suitable to the level you have identified.

One of the most common systems for categorizing and labeling objectives is called Bloom's Taxonomy, after Benjamin Bloom on whose work it is based. In order to give you some idea of how much effort will be required to learn the material in the guide and to give you a sense of what writing objectives is all about, we have included below a short pretest.

Complete the test now and check your answers against those shown on page 5.

PRETEST OF BLOOM'S TAXONOMY OF BEHAVIOURAL OBJECTIVES

The list below contains the names of the six cognitive levels of Bloom's behavioural objectives. Rank order the objectives by placing a 1 before the simplest objective, on up to a 6 before the most complex objective.

_____ a. Comprehension

_____ b. Application

_____ c. Knowledge

_____ d. Synthesis

_____ e. Evaluation

_____ f. Analysis

The following list contains ten (10) instructional objectives. Write the name of the appropriate level of objective in the space to the left of each instructional objective. That is: Comprehension, Application, Knowledge, Synthesis, Evaluation, or Analysis.

_____ a. Define the term learning as it would be used by John B. Watson.

_____ b. Convert the following from inches to millimeters.

_____ c. Diagram the following sentence: They were going bananas.

_____ d. Write a ten page essay on the benefits of Canada maintaining a neutralist position with regard to foreign affairs.

_____ e. Prepare a normal, sterile saline solution.

_____ f. Read the following sociological study and criticize it in terms of the research methods used, rationale, and supporting theory.

_____ g. Write a 5 page paper supporting the argument for Western Canada Separation.

_____ h. Label the following parts of the Hydra.

_____ i. Read the attached copy of Prime Minister Trudeau's address to the Canadian people and summarize the major points in one gesture.

_____ j. Plan a 30 minute activity on colours for an educable mentally retarded child using the learning principles discussed in class.

Answers to the Pretest:

Part 1:

___2___ a.

___3___ b.

___1___ c.

___5___ d.

___6___ e.

___4___ f.

Part 2:

Knowledge a.

Comprehension b.

Application c.

Analysis d.

Synthesis e.

Evaluation f.

Evaluation g.

Knowledge h.

Comprehension i.

Synthesis j.

If you have missed more than one item on either part of the pretest, you will find the following material helpful in the development of objectives that will not only enhance your instruction, but will be a very important component in helping your students to learn more effectively and efficiently.

One final comment is important.

While reviewing your answers to this test as well as those throughout the Guide, you may feel strongly that where your answer differs from ours,

yours is correct. Actually, both of our answers may be correct. Here is the reason. What we really expect students to do in a course exists as an idea in the mind of the instructor. Sometimes it is difficult to express that idea so that everyone unanimously agrees about the apparent level of cognitive complexity. Usually these disagreements are small and infrequent. If they occur often, it is a matter for immediate attention. If not, the best plan may be to try out your objective and then try to improve the wording before you teach the course or program again.

PART II

OBJECTIVES

IN

PERSPECTIVE

PART II

OBJECTIVES IN PERSPECTIVE

THE PURPOSE OF OBJECTIVES

Preparing a set of objectives is an essential early step in the development of any course. Objectives point the way for all subsequent development in a course. They provide you with a focus for preparing the course materials and they provide your students with a guide for mastering the course content. In addition, they provide your department, your colleagues, your division, and indeed the entire institution with a statement of the nature of the education which is being carried out. In other words, carefully prepared objectives can facilitate planning and learning at all levels within an institution. According to Wilbert McKeachie (1978), "the first step in preparing for a course is the working out of course objectives, because the choice of text, the selection of the type and order of assignments, the choice of teaching techniques, and all the decisions involved in course planning should derive from your objectives."

There is an ongoing debate about how general or how specific objectives should be and whether or not they should be written in behavioural terms. (Behavioural refers to specifying specific behaviours which the students will be required to perform in order to demonstrate mastery of course material.) This debate is often fraught with dogmatic arguments which cause frustration and anxiety among course developers. We suggest you don't get caught up in a debate but rather try and keep a couple of things in mind.

The first thing to keep in mind is that objectives should assist you in planning your course, selecting materials, and designing learning experiences for your students and in making it clear to your students what is expected of them in the course. If you find that the objectives that you have prepared are helping in these ways then they are effective. They may not be perfect, perhaps they could still be improved, nevertheless you should feel that they are effective.

The second thing to keep in mind is that objectives written in behavioural terms may or may not help your students to learn more than if they had objectives using other language. However, if you can manage to put an objective into behavioural terms it will probably go a long way towards helping you to clarify your thinking about what you are trying to accomplish, how to go about it, and how to assess your students' progress. In trying to relate objectives to the behaviours you expect from your students it may be useful to consult colleagues, samples of other courses, or resources in the Centre for Improved Teaching. However, if after you have done all of this you can't quite come up with a suitable behaviour based objective don't despair. Go with what you've got, don't leave something out of the course simply because you can't develop a behavioural objective that the other aspects of course development are totally neglected. Remember, the acid test of what is a good objective is "does it work".

TOPICS, GOALS AND OBJECTIVES

While the above comments caution against too heavy an investment of your time in objective writing, it is still the case that objectives are an essential part of any course and there are certain basic concepts which should be incorporated in any objective which you prepare. One of these

concepts is the difference between topics, goals, and objectives.

It is very common to see course outlines which contain a list of topics to be covered, perhaps the text book references for the topics and even the date on which the topics will be covered in lectures. While this may be helpful, there are important limitations to the utility of a list of topics.

Stating a topic certainly delimits the area of study but it doesn't really provide an awful lot of information even if the topic is very specific. For example, consider the topic "Microcomputers in Small Businesses in Central British Columbia." Do you want your course to provide students with a general appreciation of how microcomputers are used, do you want them to be able to describe the systems of software or brands of hardware that are used, do you want them to be able to evaluate the effectiveness of the use of microcomputers, or do you simply want them to present facts and figures which give a general sense of the extent to which microcomputers are becoming commonplace in small businesses. These questions all suggest decisions which have to be made as you continue planning your course.

Goals are somewhat more specific than topics. For example, goals related to the topic of microcomputers described above might include the creation of a positive attitude towards the use of microcomputers in small business; appreciation of the investment in manhours necessary to get a microcomputer system in place; of evaluation of positive and negative generalizations often made about microcomputers in small business. As you can see, these goal statements are somewhat more specific than simply a statement of topic. They would be more informative to you and your students and would be more useful in designing your course.

Objectives are more specific than goals and carry a good deal more information. They will help you choose texts and design learning experiences and they will assist students in understanding what your course is about and how well they are doing. For example, regarding the goal of creating a positive attitude towards microcomputers, a specific objective might be to have students describe ways in which microcomputers can lead to reduced costs and better service in small business. Regarding the goal to help students appreciate the detailed planning required to install microcomputers in a small business, this objective might be suitable - prepare a plan for installing a microcomputer system in the parts department of an automobile dealership and explain the importance of including or deleting each component of the plan.

In designing a course there is often a question about whether or not it is necessary to sit down and first list all of the topics and then list all of the goals and finally list all of the objectives. There is really no straightforward answer since planning should usually not be done for the sake of planning but rather as a means to an end. In order to decide where to start, have a look at what you already know. Is the place of the course in the students' curriculum clearly defined? How will the students use what they learn in the course; i.e., what must they know to enter the job market or to carry on with further study. What is the level of ability and expertise among students who will be in the course? If the course has multiple sections taught by many different people, does everyone agree on what should be included? Is everyone really clear on the general goals for the course? How have students performed in previous courses which had these same goals? These and similar questions will help you to decide where to start in planning your course. This

guide assumes that you have some idea of the overall.content and goals of the course and that you are ready to write specific objectives. If you are really still at the stage of deciding on topics or general goals there are other techniques you may want to utilize in helping you make those choices. These are not described in any detail in this guide.

A FRAMEWORK FOR SYSTEMATIC OBJECTIVE WRITING

Objectives are typically divided into three categories: Cognitive, affective, and psychomotor. Cognitive objectives deal with the students' critical thinking skills and how we want them to process information. Affective objectives deal with the feelings, attitudes, and values which students develop. The third category includes specific motor skills which we want students to develop distinct from the way they think or feel. Certainly these categories are not entirely discrete and in many courses all three types of objectives must be present. However, as most instructors are faced with developing cognitive objectives and it is about these objectives which we most often have questions, this guide deals with cognitive objectives exclusively. Further editions of the guide may deal with other types of objectives.

Based on discussion with several instructors and the work of many researchers we suggest a simple two-dimensional framework for organizing course material and developing specific objectives. One dimension of this framework is course content. This dimension simply lists course material in the order in which it is best studied. Considerations such as some topics being prerequisite for the mastery of others, historical organization of course material, or almost any other logical framework identified by the instructor can be the basis for ordering topics along the course content dimension. The other dimension, cognitive complexity,

classifies thought processes along a continium ranging from the performance of simple recall tasks to the level of greatest complexity where judgments about the suitability of solutions to problems must be made. The two-dimensional content by cognitive process framework is pictured on the following page as a quick summary of our overall approach.

FRAMEWORK FOR DEVELOPING OBJECTIVES

LEVELS OF COGNITIVE COMPLEXITY ⟶

COURSE CONTENT	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
SPECIFIC CONTENT ARRANGED IN SOME LOGICAL SEQUENCE						

IN PRINCIPLE, EACH SQUARE IN THE FRAMEWORK WOULD CONTAIN A STATEMENT DESCRIBING CONTENT.

By the time you have completed the guide and the activities, you will be able to identify and write objectives for the six levels of complexity in Bloom's Cognitive Taxonomy.

Specifically, you will be expected to accomplish the following objectives by following the guide and the activities included in it:

1. Write, in the proper order, the six levels of complexity in Bloom's Cognitive Taxonomy.
2. For each level of complexity in Bloom's Cognitive Taxonomy define the performance required.
3. Given examples of objectives, identify the levels of Bloom's Taxonomy where they should be classified.
4. When you are presented with an objective, identify the level of complexity, performance required, and state why that performance is an example of the specified level.
5. From a given topic or a topic of your choice, write an objective for each level of Bloom's Cognitive Taxonomy.

The basic idea is that different courses and different programs demand different levels of ability and performance from the students. For example, the instructor in an introductory biology course may be satisfied with her/his students learning the basic definitions, while an instructor in an auto mechanics course is interested in the students' ability to apply the information from the classroom to the practical situation. The ability to apply one's knowledge is more complex, and hence, quite different from the simple knowledge of definitions and terms.

Bloom's Taxonomy is really nothing more than a listing of abilities in order of complexity. In the case of his cognitive taxonomy, six types of abilities are listed, from simple recall or recognition of knowledge on through to the very complex ability to evaluate. The two purposes for using a taxonomy in writing a behavioural objective are: (1) to identify the cognitive, psychomotor, and affective abilities involved in a teaching-learning situation, and (2) to let the learners know exactly what they are expected to do in a particular course or program. That is, the student will know whether he/she is to recall facts, apply facts, or analyze a problem situation, etc. Although other cognitive taxonomies have been developed, Bloom's is the most popular.

EXERCISES

The remaining portion of Part II of the guide consists of a series of six exercises designed to teach you to identify and write behavioural objectives for each of Bloom's taxonomic levels which are: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. The exercises will be followed by a mastery test.

EXERCISE #1

KNOWLEDGE OBJECTIVES

Two instructors in an introductory College psychology course submitted a list of objectives for their course. Below are portions of their lists of objectives.

INSTRUCTOR X	INSTRUCTOR Y
- The student will define the term learning	- The student will list the important characteristics of learning and explain how these characteristics distinguish learning from maturation.

INSTRUCTOR X	INSTRUCTOR Y
- The student will reproduce the types of learning with an example of each	- The student will reproduce the types of learning and indicate the characteristics that distinguish one type of learning from another
Examples discussed in class, the student will match them with the learning types discussed in class	Examples not discussed in class, the student will match them with the learning types discussed in class

Which of the instructors is asking for a higher level of learning from his/her students?

If you answered Instructor Y, you are right on. In every case, Instructor X was requiring his/her students to give back the identical information as presented in class, in the same form, while Instructor Y asked his/her students to do additional things with the material they had learned.

If you were aware there was a difference in the level of complexity between the two lists, you are in pretty good shape. If you did not pick up the difference between the two lists, don't worry about it, because that is what this booklet was put together for: to teach you to sort out the levels of complexity of objectives.

The objectives employed by Instructor X are from the simplest level of Bloom's Taxonomy, that of Knowledge. While the knowledge objectives may be the simplest or lowest level of objective, this level is basic for introductory or beginning courses or programs where a number of facts, definitions, terms, and concepts must be mastered. The point you have to keep in mind, is that this level of performance only requires the learner to recall or recognize the material from memory in virtually the same form as it was learned. To make sure that you appreciate the many

situations where the knowledge objective is utilized, here are some further examples:

Specific facts,

Terms and Definitions,

Methods and Procedures,

Basic Concepts,

Principles, and

Trends and Sequences.

Bloom suggested that certain verbs are commonly used when writing objectives at the knowledge level. By recognizing these verbs, you may find it a bit easier to identify knowledge objectives. Examples of some of the verbs used at the knowledge level are:

acquire	distinguish	list	outline
define	identify	match	reproduce
describe	label	name	select
state	tell		

To maintain a degree of continuity, we are going to take a specific example and follow it through the cognitive taxonomy to see how the objective changes with increased complexity.

Key Example:

The t-test is a commonly used statistical test for determining whether the average performance of one group differs from the average performance of another group due to experimental factors or due to chance factors. A knowledge objective might be:

The following values are used in the computation of the t-test.

Define each term: mean, variance, and N.

In the key example, the student is asked to reproduce intact, the definitions presented in class or in assigned readings.

Here are several additional examples of knowledge objectives:

List the endocrine organs of the human being.

Define the term hearing.

Outline the steps for operating the AES Word Processor.

*****Now it is your turn. Take a shot at writing a knowledge objective:

_____

_____

_____

_____

To determine whether your objective is reasonable, look back on page 17. Have you utilized any of the terms from Bloom's list in your objective? Did you ask for information in the same form as it was presented to the learner? If the answer to both of these questions is yes, you are off and running. If the answer to either one is no, have another go at exercise #1, to make sure you understand it before we go on into some heavier material.

The distinction between knowledge objectives and the more complex objectives will become clearer as we move ahead.

EXERCISE #2

COMPREHENSION OBJECTIVES

The next level of complexity on Bloom's Cognitive Taxonomy is Comprehension. Bloom conceives comprehension to involve at least three different operations. First and basic is translation, as in translating from one language to another; second, interpretation, such as sifting out the essential from the non-essential; and third, extrapolation, where you

are attempting to make inferences in order to predict, on the basis of the data you have available.

In effect, comprehension refers to the students' ability to understand, or grasp the meaning of the knowledge attained in the first cognitive level.

Returning to our Key Example of the t-test. An example at the comprehensive level may be written:

> Given the formula for the t-test, rewrite the formula in verbal form, identifying each term and the mathematical procedure involved:
>
> $t = \underline{M1} - \underline{M2}$

In this Key Example, the task for the student is to translate a mathematical formula from symbolic to verbal form.

Bloom suggests the following list of verbs which are commonly used in comprehension objectives:

convert	explain	give examples	predict
distinguish	extend	infer	rewrite
estimate	generalize	paraphrase	summarise

Some additional examples of comprehension objectives that may be helpful are:

- Translate the following paragraph into French.
- Using the attached graph indicating the population growth of Canada since 1900, predict the population in the year 2000.
- In your own words, explain the concept of dark adaption.

Here we go again, its' your turn now!!

How do comprehension objectives differ from knowledge objectives?

_____

_____

_____

Your answer should have included the following components: An understanding of specific material and ability to restate or paraphrase that material.

Now to make sure that we have the difference between behavioural objectives of the knowledge and comprehension variety clearly differentiated, we will run a little check.

In the list below, are six examples of behavioural objectives. On the line to the left of each objective write a K if you feel it is a knowledge objective or a C if you feel it is a comprehension objective.

____ 1. Convert the following distance from miles to kilometers.

____ 2. Define the term behavioural objective.

____ 3. List the three major symptoms of a myocardial infarction.

____ 4. The following graph represents the amount of volitional activity exhibited by the adult female rat over a 15 day period.

____ 5. Identify the names of the major parts of a tooth.

____ 6. Paraphrase Edward L. Thorndike's - Law of Effect.

Your answers to this little gem should be: Items 2, 3, and 5 were knowledge objectives, and, items 1, 4 and 6 are comprehension objectives. Hopefully you are on a roll and have completed all six of the items correctly. If not, do a re-run, and catch up on the points that you missed.

*****Next up, seeing you are coming along so well, is a trial run at writing your own comprehension objectives:

_____

_____

_____

Your objective should have asked the student to show some evidence of understanding of the material, and in addition, should involve translation, interpretation or extrapolation of that material. Refer to page 19 to determine whether the performance term you chose is in line with those suggested by Bloom.

EXERCISE #3

APPLICATION OBJECTIVES

The third level of complexity in the cognitive objectives is Application. Application refers to utilizing the learned information in new settings. For example, it refers to the students' ability to apply rules, concepts, methods, principles, and laws to new situations.

Referring again to our Key Example of the t-test, here is what an application objective looks like:

> Given the following means, variances, N's and critical values of t, determine whether the means are significantly different at the 95% level of confidence.

This objective has asked the student to take the concept of the t-test and actually apply it in a practical situations.

Again from Bloom, we have a list of some of the commonly used verbs for the application objectives:

apply	demonstrate	modify	prepare	show
change	discover	operate	produce	solve
compile	manipulate	predict	relate	use

A few examples may help you understand the application objectives, by using some of these verbs:

- Solve the following statistical problems.
- Demonstrate the use of the micrometer caliper.
- Show the procedure for lens centering and marking.
- Given a job sheet for a pantograph engraving, use the procedures for setting-up, centering copy, and determining specific ratios.

Well its' about that time again, so we have another try, this time, how do application objectives differ from comprehension objectives?

_____

_____

_____

Your answer should cover the points that the student at the application level is supposed to utilize the newly acquired information in new or different settings, while the ability to use this information is not required at the comprehension level.

To keep your skills up to date, we have another small quiz for you. In the list below are six behavioural objectives. Place a K on the line to the left of the item if you feel it is a knowledge objective, a C if you feel it is a comprehension objective, or an AP if you feel it is an application objective.

_____1. Utilize the following formulas for the computation of the mean and standard deviation.

_____2. Explain the rationale upon which behavioural objectives are based.

_____3. List the five most common food sources used by man.

_____4. Demonstrate how to make a transparency for use with an overhead projector, following the instructions in your A-V Manual.

_____5. Match the following authors with the titles of the books they have written.

_____6. Translate Skinner's term Operant by giving an example.

Your answers to this quiz should read as follows: Items 3 and 5 are knowledge objectives, Items 2 and 6 are comprehensive objectives, and Items 1 and 4 are application objectives.

*****Again, if you had problems in sorting out the three different levels, go back and get them sorted out before going any further. If you had no difficulties, your next task is to write your own behavioural objective at the application level of cognitive functioning.

_____

_____

_____

Hopefully, your objective required the student to use his/her knowledge in a new or different way. Look back at page 22 to determine whether your performance term matches one of those suggested by Bloom.

EXERCISE #4

ANALYSIS OBJECTIVES

Analysis may be defined as the ability to separate information into its component parts, to be able to identify the specific parts, to analyze the relationships among the parts, and to recognize how the parts are

organized. In effect, then, analysis involves the understanding of both the content and the structure of an area of knowledge.

From our Key Example, we have the following analysis objective:

> List the information that you will need to compute a t-test on two sets of scores and indicate how each unit of data relates to the final value of t.

In this example, the student would list the mean, N, variance, and then would describe how each of these influences the t-test and relates to the other components.

Bloom suggested a number of verbs that are commonly used with analysis objectives:

break-down	discriminate	illustrate	print-out	separate
diagram	distinguish	infer	select	subdivide
differentiate	identify	outline	relate	compare

To help you become more familiar with analysis objectives, here are a couple of examples:

- List the assumptions that Piaget makes about the nature of the reasoning and thought process in the child from 2 to about 7 years of age. Identify the impact of Piaget's Theory of Cognitive Development on current elementary education.
- Given a specific classroom situation, identify the following internal and external variables affecting the behaviour of the student, stating how they might ne changed to improve instruction: readiness, motivation, instructional style, course content, effectiveness of instruction for the needs of the students.

Now it's time to get to it again. What we would like you to do this time is give a brief description of the level of competence required by

analysis objectives which is not required by any of the less complex objectives.

_____

_____

_____

To cover this one, you should have noted: Identifying the components of a particular area, point out the relationship among these components, and then show how the components are organized.

Here it is again, quiz time; but like the others, this quiz is to help you learn, and not to make judgments on your character.

In the list below are eight behavioural objectives. To the left of each objective, place a K if you feel it is a knowledge objective, a c if it is a comprehension objective, an AP if it is an application objective, or an AN if it is an analysis objective.

____ 1. Given a list of symptoms, the student will suggest a possible mental disorder which is producing the symptom pattern.
____ 2. Diagram the following sentence: One swallow doesn't make a summer.
____ 3. Given a current topic in special education, use the Educational Index to locate and identify five publications about that topic published within the last year.
____ 4. The student will summarize the pros and cons of collective bargaining during class discussion.
____ 5. Given a painting of one of five major Canadian artists of the twentieth century, list three artists whose work influenced this painting and indicate the evidence for this influence in the painting.
____ 6. Given the necessary materials, the student will disassemble a coloured magazine clipping into its basic colour values by tearing it into small pieces and sorting them according to colour values.

Your responses to these items should be: Item 1 is Knowledge; Items 2, 5, and 6 are Analysis; Item 3 is Application; and Item 4 is Comprehension. If you had problems with these items go back and review before going any further.

*****Now, have a go at writing your own analysis objective:

_____

_____

_____

_____

Your objective should have included: Breaking the whole into parts; analyzing the relationships among the parts within a particular area of knowledge; and the organization of the parts. Check Bloom's list of verbs on page 24 to see if your performance term matches one of the terms listed there.

EXERCISE #5

SYNTHESIS OBJECTIVES

Synthesis requires the student to be creative. That is, the student is to create a new whole out of the parts available, or to solve a problem using creative, original thinking. The resulting product should involve either a unique communication, a plan of operation, or a set of abstract relations. The major emphasis is on the formulation of new patterns or a new structure.

Continuing with the Key Example of the t-test, a synthesis objective would be:

> Design a study in which the t-test would be an appropriate analytical technique for testing significance. Keep in mind the assumptions underlying the t-test, the number of means which can be handled by the t-test, and the situations in which the use of the t-test is appropriate.

This objective requires the student to use his/her accumulated knowledge about the t-test to design an experiment in which this knowledge would be

demonstrated. This ability requires all of the previous levels of performance we have covered to this point. That is, knowledge of the t-test, comprehension of the t-test, ability to apply the t-test to a set of data, and a knowledge of the specific components, their relationships and organization of these components when running a t-test.

Some of the verbs Bloom has used quite frequently when writing synthesis objectives are:

categorize	create	generate	rearrange	revise
combine	devise	modify	reconstruct	rewrite
compile	design	organize	relate	summarize
compose	explain	plan	reorganize	write

To aid your understanding of the synthesis level objectives, here are several examples:

- Given the characteristics of Piaget's formal operations stage, (ages 11-17), design a learning activity for a secondary school student.
- Given a batch of research data, develop a hypothesis that could be tested and which could provide the basis for an experimental design.
- Given a topic sentence from Developmental Psychology, write a relevant paragraph.

With these objectives in mind, how does the synthesis objective differ from the lower level objectives in Bloom's Taxonomy?

Your answer should have included ability to put parts of a unit together to form a new whole through producing a unique communication, new plan of operations, or set of abstract relations.

Identify the complexity level of the following behavioural objectives. To the left of each objective write a K if the objective is Knowledge; a C if it is Comprehension; an AP if it is Application, an AN if it is Analysis, and a S if it is Synthesis.

____ 1. How would you utilize a Coholt radiation source to successfully destroy an internal, inoperable malignant tumor without harming healthy tissue? Your answer should be based on these facts: (1) Coholt radiation destroys living tissue, (2) both healthy and malignant tissue are destroyed and (3) the intensity of radiation can be controlled.

____ 2. Using the principles of political science on the relationship of the citizen to his/her elected government officials, the techniques of successful communication, and the characteristics of the developing child, plan a strategy for lobbying in Ottawa to affect the institution of a national program of comprehensive Nursery Schools. You should include the individuals in Ottawa that you would contact, how you would organize your arguments based on the political orientation of the official, and what the characteristics of the Nursery School Program would be.

____ 3. The student will summarize the new Canadian Constitution in his/her own words.

____ 4. Using the basic vocabulary and grammar of your introductory French course, write a 500 word autobiography.

____ 5. Given a checklist of the 10 qualities of a good speaker, the student will rate another class member giving an oral presentation by checking Yes or No with respect to each quality.

____ 6. The student will identify conflict in a given short story by identifying the opposing forces, incidents which illustrate the conflict, and the point in which the conflict occurs.

Answers to these items are: Items 1 and 5 are Applications; Items 2 and 4 are Synthesis; Item 3 is Comprehension, and Item 6 is Analysis. If you goofed, go back for a re-run before going any further.

*****If you had no problems, have a try at choosing a topic and making up a Synthesis objective of your own.

_____

_____

_____

_____

_____

_____

Your objective should have requested the student to use his/her previous knowledge to: Create something new, solve a problem by combining previous knowledge in new ways, or to devise a set of abstract relations to explain some phenomenon. Check Bloom's terms on page 27 to determine whether your performance term matches any of the ones he suggested.

EXERCISE #6

EVALUATION OBJECTIVES

Evaluation refers to the ability to judge the relative value of material for a given purpose. These judgements are based on definite criteria, which may be either internal or external in nature. The internal criteria pertain to the organization, structure, and content of the material, while the extrnal criteria pertain to the purpose of the material.

The student may set the criteria or the criteria may be determined by someone else. The evaluation objectives are the highest level of complexity on Bloom's Cognitive Taxonomy as they include all of the components from the previous objectives, plus the additional component of making conscious value judgements.

Returning again to our Key Example utilizing the t-test, here is an evaluation objective:

Read the following study and evaluate the statistical analysis of the data based on your knowledge and understanding of the t-test for determining significance. Was the t-test used correctly, if so why? What assumptions were met? If assumptions were not met, what was violated? How could the statistical analysis of this study be improved?

The performance demanded of the student in this objective is the highest level of complexity in Bloom's Cognitive Taxonomy because it requires: A knowledge and understanding of the t-test; ability to apply the t-test to a set of data; ability to analyze the factors, assumptions and relationships involved in using the t-test, ability to predict and design studies using the t-test in the correct manner; plus, ability to determine whether the t-test was used correctly in supporting the decision. Another way of saying it, is that all previous cognitive levels are combined for the purpose of making a decision.

As with each of the other objectives, Bloom has suggested a list of verbs that are commonly used to describe performance in the evaluation objective:

appraise	contrast	discriminate	interpret
compare	criticize	explain	relate
conclude	describe	justify	summarize
			support

To make sure we are going in the same direction here are a couple of examples of Evaluation objectives:

- Given the mainstreaming program currently used in the British Columbia Elementary and Secondary Schools, evaluate that program in the light of Bloom's Learning for Mastery. Specify those aspects of the program which meet Bloom's requirements and those which do not. How could the program be improved to better meet the requirements of mastery learning?
- In the light of the hassles over our new Constitution, the struggle between the Provinces and the Federal government for power, the potential separation of Quebec and/or the Western provinces, evaluate:

  1) the effectiveness of the Canadian Constitution for setting down the characteristics of a democracy, and 2) the effectiveness of the Canadian Constitution in maintaining a democracy.

It has probably dawned on you by now, that as the objectives become more complex in terms of what is demanded from student performance, the objectives also become longer. However, the length of the objective does not determine its complexity, as you just may have a very wordy-type person writing a simple (Knowledge) objective. The major reasons for objectives becoming longer as they increase in complexity is that we have to specify to the students the task(s) they will have to perform, as well as the specific conditions under which the performance will occur. What you are doing in effect, is specifying the course content, abilities and skills that you feel are important, thus directing the student's attention in a selective manner.

Now we come to your chance again. How do evaluation objectives differ from the previous cognitive objectives in Bloom's Taxonomy?

_____

_____

_____

Your response should cover the idea of the ability to make a judgement or decision about the relative merit or value of a piece of work, based on either the students' criteria or criteria provided for him/her. All of the previously learned abilities are necessary to make this value judgement.

Now its quiz time again to see if you still have everything organized. In the space to the left of each behavioural objective write: A K if it is a Knowledge objective, a C if it is a Comprehension objective, an AP if it is an Application objective, an AN if it is an Analysis objective, a S if it is a Synthesis objective, and an E if it is an Evaluation objective.

_____1. Dissect a cat without breaking any major blood vessels and identify the following structures.....

_____2. Given the financial statement of the Bullticky Corporation, audit the books, determining: If all monies are accounted for, possible areas of mismanagement, and proposed changes in monetary policy. Accept or reject the financial statement and justify your decision.

_____3. Given Darwin's laws of evolution, and the requirements of our culture, describe man's probable physical and mental characteristics 1,000 years from now.

_____4. Given a prospective candidate for your program in Business Administration, use the students' transcripts, references, and interview results; the requirements and philosophy of your department; and the number of students applying for admission; and make a decision as to whether the student would be admitted to your program.

_____5. Given the excerpts from five poems, identify the author of each poem.

_____6. Review the activities of KNOW (Knowledge Network) and criticize the effectiveness of this program on a cost/student basis.

Okay, let's do a tally and see where you are at. Item #1 is an application objective, Items 2, 4, and 6 are evaluation objectives, Item 3 is a synthesis objective, and Item 5 is a knowledge objective. Hopefully, you have done well on this short quiz. If not, go back and do a re-run before going ahead.

*****Next up then is to write your own evaluation objective:

_____

_____

_____

_____

_____

Your objective should have requested the student to make a decision or judgement about some material on the basis of self-generated criteria or criteria provided by another source. Check Bloom's suggested performance verbs for the evaluation objectives on page 30 to see if you used one of those suggested.

We realize that these last several tasks in Bloom's Cognitive Taxonomy were a bit heavy, but you have managed to hack your way through all six levels.

In summary, the knowledge objectives ask you to reproduce information in the same form in which it was presented. Comprehension objectives on the other hand, involve the translation, interpretation, and extrapolation of the information you are given. In application objectives you are asked to utilize your newly learned information in new or different situations. The ability to separate information into its component parts, analyze

the relationships, and recognize how the components are organized is the task requested by the analysis objective. Synthesis objectives require problem-solving using creative, original thinking, where the parts of information are combined into a new whole. Evaluation asks for you to judge the relative merit of some material using your own criteria or those assigned by an outside source.

It would be really great if the differences between these different levels of cognitive objectives were clean with no overlap. Unfortunately, that is not the case, so it will take some amount of reading and a great deal of practice to sort out which behavioural objective is at what level of complexity in Bloom's Cognitive Taxonomy.

Don't waste your time diddling around or haggling over whether the behavioural objective is mostly analysis or analysis with a little bit of synthesis. The <u>main point</u> that you should be keeping in mind is that you are using the behavioural objectives to let your students know exactly what you want them to do.

Just to let you know that you are not getting off the hook without one last shot, we have set up the folloiwng Mastery Test to let you know where you stand on Bloom's Levels of Objectives in the Cognitive Domain.

MASTERY TEST

ON

BLOOM'S LEVELS OF OBJECTIVES IN THE COGNITIVE DOMAIN

Go through the test item by item beginning with number 1.

1. List the six (6) levels of objectives in Bloom's Cognitive Taxonomy in order of complexity, beginning with the simplest.

   a. _____

   b. _____

   c. _____

   d. _____

   e. _____

   f. _____

2. In the list below are the six levels of Bloom's Cognitive Taxonomy given in the order from the simplest to most complex. (You can use this list to check your responses to the first item.) After each level, indicate the student's task.

   a. Knowledge

   b. Comprehension

   c. Application

   d. Analysis

   f. Evaluation

3. The list below contains six behavioural objectives. Identify the complexity level of these objectives using the code: K = Knowledge, C = Comprehension, AP = Application, AN = Analysis, S = Synthesis, and E = Evaluation. Write the correct response to the left of each objective.

_____a. Given a list of parent-adolescent interactions in eight cultures, indicate those which exhibit characteristics which support Erik Erikson's theory of personality development.

_____b. Given the following graph of the number of traffic accidents in Prince George, and the time of day they occurred, which of the following statements are true.....

_____c. List the transient elements in the Periodic Table of the Elements, explain how they are alike, how they differ, and the significance of their position in the table of elements.

_____d. Given the 10 file types presented in class, identify each correctly by name.

_____e. Currently there is a movement to develop a sex education program within the education system. Justify the need for such a program, citing precendents and data for such a need.

_____f. Develop a lesson plan for a high school P.E. class which will include the: Teaching of the use of rules in social games and the development of large muscles. Include in your plan a procedure for adapting the activities to individual differences.

4. Write a behavioural objective for each of the levels of Bloom's Cognitive Taxonomy. Select any topic of study, but use the same topic for all of the objectives.

TOPIC OF STUDY:

Behavioural Objectives:

Knowledge

Comprehension

Application

Analysis

Synthesis

Evaluation

SCORING KEY FOR MASTERY TEST

ON

BLOOM'S LEVELS OF OBJECTIVES IN THE COGNITIVE DOMAIN

1. The list given in item #2 is the correct response.
2. Knowledge - requests recall of material in virtually the same form. No implication of understanding.

   Comprehension - involves understanding as shown by ability to translate, interpret, or extrapolate.

   Application - utilizing one's learning in new situations.

   Analysis - the ability to separate material into parts, see relationships and organization among these parts.

   Synthesis - the utilization of past learnings to create something new.

   Evaluation - the utilization of your own or other's criteria to make judgements about the relative worth of some material.

3. AP a.

   C b.

   AN c.

   K d.

   E e.

   S f.

4. For each level of objective, compare your response to the response listed for item #2.

To obtain a score for the Mastery Test, there are six (6) parts to each of the four (4) items, hence, 24 items total.

A mastery level of 85% is acceptable, which is 20/24.

PART III

COMMON PITFALLS AND PROBLEMS IN WRITING OBJECTIVES

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COMMON PITFALLS AND PROBLEMS IN WRITING OBJECTIVES

There are three major aspects involved in setting up instructional objectives. The first, is to specify the conditions under which the behaviour is to be performed. The second, is to describe the behaviour which will demonstrate the learning and the third is to specify a criterion or standard for assessing that behaviour.

When specifying the conditions under which the behaviour is to be performed, it is necessary to include all restrictions or constraints in the objective. That is, you have to specify such things as whether or not there are: Time limits; written or oral presentations; references to one's own ideas; and so forth.

As an example of the specifications of conditions, the following objective should do the trick:

> The student is expected to present a 10 minute speech on the effect of natural mercury pollution on the summer stratification of a small lake not exposed to the effects of mining or soil exploration.

OBJECTIVES SHOULD DIRECT STUDENTS

A very unfortunate aspect of this whole area of instructional objectives is that all too often the instructor uses the objectives to tell the

student what he/she is expeted to do. The genralization, then, is that objectives should be stated in terms of what the student will be expected to do at the completion of the instructional unit.

Using behavioural objectives from Bloom's three domains, the following are correctly stated objectives.

Cognitive	a. The student is expected to differentiate between nosology and etiology.
Affective	b. The student will show an appreciation for music by being able to sing and use a musical instrument to satisfy personal and social life.
Psychomotor	c. The student is expected to demonstrate the tennis serve in the manner demonstrated by the instructor.

OBJECTIVES DO NOT DESCRIBE COURSE CONTENT

Another problem that many instructors encounter when they get into the objective writing business is their tendency to describe course content. Here, the instructor goes down the line listing the various topics that he or she has included in the course. For example:

a. The course will include a section on operating the Word-11 Processor.

b. The course will include a section on operating the AES Word Processor.

(Both of these statements are incorrect when used as objectives!!)

c. The student is expected to utilize the Word-11 and AES Word Processor according to the procedures explained and demonstrated in class.

(This objective is stated correctly).

OBJECTIVES DESCRIBE EXPECTED STUDENT PERFORMANCE

Still another area of confusion around sorting out the difference between the performance expected from the student and the method for the student to accomplish that performance. All too often, the emphasis is placed on the method of accomplishing the objective, when it is the student's performance that we are really interested in measuring.

Which of the following behavioural objectives are correct?

1. The student is expected to identify the adverbs in the following sentences by underlining them.
2. The student is expected to underline the adverbs in the following sentences.
3. The student is expected to draw a map of Canada showing the lines of longitude and latitude.
4. Given a map of Canada, the student is expected to identify the lines of longitude and latitude by correctly labeling an example of each.

For the above four objectives, items 2 and 3 are incorrect. Item 1 and 4 is written so it emphasizes the student's performance. The other three items are emphasizing the method expected for the student to accomplish the performance.

OBJECTIVES SHOULD BE CLEAR AND UNAMBIGUOUS

As with the writing of examination items, a generalization that also holds for writing objectives is that they should be clear and unambiguous. Hence, the student has to know exactly what the instructor has in mind if an objective is to be meaningful and useful. To accomplish this goal, consider: First, the vocabulary level and reading ability of your students; second, omit terms that are unfamiliar to the students if they are not part of the objective to be learned (there are many other ways to impress your students with your vast knowledge than a vocabulary display in the objectives); and third, try to avoid the use of terms that are open to misinterpretation.

The following are some sure-fire terms for getting yourself into an interpretation hassle with your students when you include them in an objective:

appreciate	like	perceive
become	learn	realize
enjoy	love	respect
feel	master	think

Some examples of where you can go wrong are as follows:

a. The student is expected to appreciate modern dance.

b. The student is expected to grasp the significance of the U.S.'s intended embargo on Canadian lumber products.

These two examples can be cleaned up a great deal by re-writing them as follows:

5. The student is expected to show that he/she appreciates modern dance by attending a modern dance recital on campus during the academic year.

6. The student is expected to show that he/she understands the economic significance of the U.S.'s intended embargo on Canadian lumber, on the forest products industry in (a) British Columbia (b) other provinces, by producing a paper of not more than 500 words.

OBJECTIVES ARE WRITTEN IN TECHNICAL FORM

The next area of concern in the writing of objectives deals with the topic of repetition. This problem often results in fundamentalist objective writers giving people from the literary world a mild-moderate seizure. The point is that objectives are not written as literary creations, but rather fall into the area of technical writing. In technical writing we want the shortest possible sentence that still conveys our meaning to the reader. Hence, it is quite acceptable to use the same terms repeatedly if they convey the information. One example commonly used in objectives is the term "given".

As an example:

7. Given a list of the ten Psychologists discussed in class and ten classical contributions in the field of Psychology, match them with their classical contribution to the field.

EMPLOYING THE TERM "AT LEAST" IN OBJECTIVES

The use of the term "at least" as a qualifier in an objective tends to blow the mind of the purist. However, the term may be used quite nicely when the performance criteria are stated in numerical terms in the objective, and when accuracy of less than 100% is acceptable. The rationale for utilizing the term "at least" would be in cases where you

want to state the minimum criteria, such as: Pages for an essay, items for an exercise, or time limits.

An example of this type of objective:

8. Given 10 computer simulation problems, the student is expected to perform at least 8 of the 10 correctly.

DIFFERENTIATING BETWEEN "NAME" AND "IDENTIFY"

A trap that many instructors inadvertently step into, is to use the term "name" and "identify" as being synonymous, which produces a few problems for the students. This problem can be nipped in the bud, by defining each term very carefully.

To name something, means to give a name for something that has already been identified. To identify something, on the other hand, is to point out something that has already been named. Giving names and pointing out are different procedures.

A couple of examples may be of value in helping to clarify the difference between a naming objective and an identification objective:

9. Given a list of nonsense quotations, the student is expected to identify those spoken by Trudeau.
10. Given ten shop tools used in the construction of a two-wheel trailer, the student is expected to orally name all ten tools.
11. Given the name of 15 anatomical parts of a cat, the student will identify 12 of the 15 currently on a line diagram.

"WILL BE ABLE TO" VS "EXPECTED TO"

Another trap we tend to fall into when writing objectives is to do an overkill with the term "will be able to". By tossing this term into an

objective, the only thing that occurs is to make the objective longer, not more meaningful. That is, the only way to determine whether the student "will be able to" perform a skill or task is to have him/her perform it. Thus, adding the term "will be able to" does not add to the meaning of the objective.

The following is an example of why the term should not be added:

12. The student is expected to be able to list the three major types of learning as discussed in class.

A better objective would be:

13. The student is expected to list the three major types of learning as discussed in class.

EMPLOYING THE TERM "CORRECTLY"

The term "correctly" is another we tend to use unnecessarily. For nearly every performance situation, it is assumed that the response we want is the correct one: Therefore, it is a bit redundant to specify the "correct" response in each objective. There are, however, some cases in which it is necessary to provide the additional cue. This is especially true when you are dealing with foreign language content.

14. The student is expected to pronounce correctly the names of the four most recent chancellors of West Germany.

By convention, we assume that students are going to provide the correct response. However, in cases of language, especially pronunciation, you may have to specify further the need for correct pronunciation.

WATCH THE USE OF MODIFYING TERMS

If possible, drop the use of modifying terms in your objectives. Modi-

fiers are especially difficult for new students who haven't learned to speak up and ask you to define what you mean by these terms. By modifiers, we are referring to terms such as major, principal, greatest, most, important, main, least, minor, and so forth. Unless you have taken great pains to specify these terms in your classes, they will have meaning for you, but not for your students. Hence, as you write the objectives, you have to tell the students why these particular subjects are the best, the most, or the greatest.

For example:

The student is expected to name the three most important cities in Canada. (Most important on what basis? Tourism? Exports? Manufacturing? As the objective stands, it is unclear and consequently somewhat frustrating.)

However, with a little thought, the objective can be easily shown.

For example:

15. The student is expected to name the three cities in Canada that have the highest volume of tourist traffic.

CLARITY TAKES PRECEDENCE OVER CONCISENESS

Although, when writing objectives, we work from the technical writing standpoint, whereby the objective is to be written in the clearest, most concise terms possible, this does not mean that the objective must be limited to one sentence. the idea is to take as many sentences as you need to state the objective clearly.

For example:

16. State a communication problem occuring in a business or industrial setting. Illustrate the process of communication analysis by constructing a flow chart to show each stage of the communication process in that business or industry. Include a brief explanation of the relationship of each stage of the process to the problem you have identified.

DON'T

We have made the observation that when instructors are writing objectives they are inclined to include every condition they can think of in every objective. The net result, is that the objective beomes a burden rather than a help. One really good example of a condition that comes back to haunt the instructor is to specify a time limit when there is no need for one. Unless an element of speed is required in the task to be learned, or time is a factor in the grading or evaluation of student performance, it is better to leave the time criterion out. A good example of this is the following objective which among other things may turn your audio-visual equipment and films into a quick package for the trash barrel:

17. In a five minute practical test, each student is expected to: unpack, operate, and repack the 16 mm. film projector, following these instructions:
    1. The film must be properly threaded.
    2. The picture must be properly framed and focused.
    3. The volume must be appropriate to the audience.

About the only thing that results from imposing a time limit in this case, is the opportunity to observe how many students have five thumbs on the same hand.

THE OBJECTIVE CONTAINS THE CRITERIA

Another of the major components in setting up instructional objectives it to include a statement of the criteria which will be used to determine whether the student has attained the objective. The criteria are usually set at the minimal level of performance deemed adequate for the student to attain the objective.

For example:

18. The student is expected to explain the rationale behind three of the four assumptions underlying the F-test which are listed in the text.

A common tendency among behavioural objective writers, especially in certain fields, is to go bananas and write an objective for every ding-a-ling detail or skill they can possibly imagine. This results in several problems: First, a hell of a drain on the budget due to paper and reproduction costs, and second, a terrific loss of student time as most of the class has had to be hospitalized for hernia surgery from carrying all of that paper around. The difficulty appears to be that many writers of behavioural objectives are not able to evolve a balance between being too specific and being too general. Unfortunately, there is no magic formula for the writer of objectives to follow. You have to make a value judgement about the importance of the behaviour you are specifying in the objective and how this relates to the knowledge or skills that the student possesses. For the new instructor, of course, everything is important and you have a list of 2,000 objectives, which is great. Unfortunately, they only cover the first two weeks of the course.

Finally, we come to the crunch. We have been dealing with the matching of course content to the objectives of the course. As you become more

adept at this operation, you will find that while you are assembling the course content to match your objectives, it is also very helpful (and very wise) to develop evaluation materials simulataneously. In effect, as you develop content and objectives, you are also considering the types of tests or examination procedures you will use to determine whether your students have attained the objectives. All too often, the objectives and content match quite nicely, while the tests and examinations appear to come from some unrelated course or program.

SUGGESTIONS FOR FURTHER READING

By the time you have finished studying this guide, you will have incorporated a powerful tool...the repertoire of skills which you use to design and deliver instruction. We have tried to provide you with the basic information needed to use this tool in a straightforward, no frills format. If you would like more information and examples of objectives, you might consider consulting some of the texts we have included in the bibliography.

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