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Module 6: Analysis of Test Questions

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Module 6

Analysis of Test Questions

Introduction

You may be wondering how to apply the concept of developmental stages in your college teaching. To help you with this, we have prepared modules dealing with different aspects of instruction. Module 6 concentrates on the analysis and writing of test questions. As you read the examples we have selected, keep in mind the characteristics of concrete and formal reasoning described in Module 2. A matter that we find difficult to resolve concerns how to give all students, those using concrete reasoning and those formal reasoning practice in appropriate levels of problem solving. At the same time, evaluation through tests should give both groups an opportunity show what they have learned, even though the formal students using reasoning will certainly demonstrate much more skill and elegance.

Objectives

After you complete this module, you will be able to classify test questions as calling for primarily concrete or primarily formal reasoning on the part of the student.

After completing this module, you will be able to write questions that are "concrete" or "formal", as needed.

Procedure

1. Look at the tests you have brought with you from your course. Mark several items on the test which you feel a student thinking concretely could answer. We shall call these "concrete" items. Likewise mark questions or problems which would require formal reasoning patterns to answer successfully. These we call "formal" items.

From your test questions, list some characteristics of "concrete" items.

List some characteristics of "formal" items.

2. Find a partner and see if the two of you can agree on your categorizations of your questions.

3. Read the following essay on concrete and formal test items. Compare your list of concrete and formal characteristics with ours. Does our list change your categorization of your test items?

Module 6 - Essay - CONCRETE AND FORMAL TEST ITEMS

We believe that test items can be classified as being concrete or formal, according to the kinds of reasoning required to respond successfully without guessing. Using the patterns described in Module 2 and restated below in somewhat different form, we categorized some items as "formal" and others as "concrete."

Items to which concrete reasoning students will be able to respond successfully include those which require them to:

1. recall or recognize information and statements (but not determine the criteria for their relevance);
2. establish one-to-one correspondence between two sets of data, serial order a set of observations, or classify observations into groups;
3. apply a memorized algorithm or formulas (but not judge its suitability);
4. use concepts defined only in terms of familiar objects, events, and situations.
5. process information and identify variables (but not systematically or completely).

We categorize items as "formal" if successful responses require the student to:

6. reason hypothetically, i.e. with the form, if...then...therefore;
7. apply theories or idealized models to interpret data;
8. evaluate results of experiments and recognize ambiguous and unambiguous conditions, i.e. to understand a general necessity for the control of variables and recognize hidden assumptions;
9. use combinatorial, proportional, or probabilistic reasoning;
10. understand and apply concepts that derive meaning through inferences from experience rather than through direct experience.

In our judgment, most questions in humanistic subjects require formal thinking for interesting answers. The obvious purely concrete questions likely to recur are those that ask for remembered information about matters such as names, dates and places. Such questions are useful both because they allow concrete thinkers the experience of success and because they tell the questioner whether the student possesses information useful in answering the interesting questions. Deciding which information is useful, however, requires formal thought.

For example, a reader aware of the role of cause-and-effect in narrative will see interest in the question: "In *One Flew Over the Cuckoo's Nest*, what was the cause of Cheswick's death?" The fact that Cheswick committed suicide is interesting because McMurphy has let Cheswick down and therefore feels guilty of Cheswick's death; his guilt-feelings in turn lead him to resume the course that leads to his own death at the novel's climactic ending.

The question, "What is the significance of Cheswick's death?" is formal if the student, to answer it successfully, must apply knowledge of causal relationships in novels to the case in hand. There are, however, ways of making such a question function as concrete; thereby, confusing the matter. Suppose a student has been told in detail the role that Cheswick's death plays in the causal sequence of the novel, and is then asked in a test to describe it. A later question about that role would then require primarily recall for an answer and would therefore be treated by most students as concrete. In our judgment, a student learns when asked to determine an answer by examining the work of literature, but does not learn when supplied by others with answers to memorize.

As if perversely to make the teacher's task still more difficult, some questions that appear to be concrete may actually be formal. Take the apparently simple "fact" of Cheswick's suicide. Good writes often allow the pleasure of inferring such facts by the use of "if...then" reasoning; as does Kesey in this case. The question, "How did Cheswick die?" may therefore be concrete if the student knows from hearing it that Cheswick committed suicide, or formal if the student is given the description from the novel and asked to infer the answer.

To underscore the point: A question is "formal" or "concrete" depending on the type of reasoning a student must do to answer it satisfactorily. One cannot tell simply from the question whether a formal or a concrete response is being requested.

Clues for recognizing "concrete" questions:

Can one or more of the following questions about a question be answered affirmatively?

- C1. Can I use a simple definition to find the answer?
- C2. Am I required to deal with only clearly observable elements of a literary work?
- C3. Can I answer the question without rephrasing it in terms of a complex concept?
- C4. Is the method for answering the question evident in the formulation of the question?

Clues for recognizing "formal": questions:

Can one or more of the following questions about a question be answered affirmatively?

- F1. Do I need to apply a familiar definition in an unfamiliar manner?
- F2. Do I need to introduce or construct an intermediate step between the question and the answer?
- F3. Do I need to select theoretical ground rules that govern the nature of my answer?
- F4. Do I need to consider the possibility that the question may be answered correctly in more than one way, and should my answer incorporate more than one possible answer?
- F5. Do I need to do a comprehensive analysis of the literary work in question before I can proceed with my answer?

The clues that we have listed are of course rough-hewn indicators rather than precise rules for classification. For your own purposes you may want to refine one or another, or to make additions to either list.

In general, "concrete" questions appear to be those answerable through the application of an evident or memorized formulas to directly observable material. "Formal" questions appear to be those answerable only after analysis of both question and data, theoretical improvisation, and awareness of method.

We believe that asking students to justify their answers can be an important part of a test, a part that particularly emphasizes the use of reasoning patterns in an identifiable way. Thus, we strongly urge you to include a few test items that require justification and for which you allow more time.

You may be familiar with Bloom's method of classifying test items (B.S. Bloom, Editor), *Taxonomy of Educational Objectives, the Classification of Educational Goals, Handbook I; Cognitive Domain*, David McKay Company, New York, 1956). The relationship between Bloom's taxonomic levels and our concrete and formal classification scheme is of interest. Basically the Bloom taxonomy allows one to classify items into one of six items: (1) Knowledge, (2) Comprehension, (3) Application, (4), Analysis, (5) Synthesis, and (6) Evaluation.

In general, any item at the Knowledge level of the taxonomy would require only pre-operational or concrete reasoning patterns for successful response (C1). Although items on this level may involve abstract theories or idealized models, students need only recall the names of such theories. They need not use them in a way that would imply that they are understood.

Items classified into the Comprehension or Application levels may require either concrete or formal thought depending upon the nature of the concept being assessed.

Test items on the Analysis, Synthesis and Evaluation levels, which require elements such as (a) recognizing unstated assumptions, (b) checking consistency of hypotheses with given information and assumptions, (c) comprehending interrelationships among ideas, and (d) comparing major theories and generalizations, all involve formal reasoning patterns.

4. Join with two other participants, in your general field if possible, and prepare an exam which contains at least two concrete items and two formal items. Post your exam for others to read. (Do NOT indicate which answers are which.)

5. Mill around the room and read the exams of the other groups. Write your comments about their exam on it. Rate each of the exam questions as concrete or formal.

6. At the suggestion of the leaders, rejoin a small group with the exam you wrote and be prepared to respond to the comments other persons have written on your exam.