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Instructional Module 2.2

"Formative Evaluation Applied to Instruction"

INSTRUCTIONAL
MODULE: 2.2

FORMATIVE EVALUATION
APPLIED TO INSTRUCTION

by

LESLIE J. BRIGGS

series editors

LESLIE J. BRIGGS
NORMAN R. DODL

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Module 2.2

Formative Evaluation Applied to Instruction

Overview

In Module 2.1, you learned that both formative and summative evaluations can be made of:

1. The instruction itself
2. The pupil's progress on an objective or unit of instruction
3. Entire instructional systems, or entire curricula for one or many years of schooling.

This module relates evaluations to the instruction, whether accomplished by self-instructional materials, teacher-conducted instruction, or combinations of several methods of instruction.

Our principle focus, however, will be upon designing instructional materials for a lesson, since materials, unlike lectures, are stable, available for scrutiny at any time, and exportable. Also, when revisions are made after each tryout, there is a permanent record of exactly how the revised materials differ from the first-draft materials.

So at the close of this module, you will be asked to plan a lesson for an objective, making the maximum dependence possible on the materials rather than the teacher as the

resource used by the pupils for learning. For this purpose, if you have developed a suitable lesson in connection with work on another module, you may be able to use it for tryout, testing, and revision (formative evaluation), followed by further revision, second tryout and summative evaluation of the lesson.

In planning for this exercise, you need to be able to do the following:

1. State a performance objective for the lesson
2. Classify the objective, using an appropriate taxonomy
3. Design a suitable measure of pupil performance on the objective
4. List the instructional events and conditions of learning to be employed in the lesson. (If you have not completed Module 5.3, which shows how to do this, you may, in your own words, list the "teaching steps" you will use. These should be designed into the materials as far as possible, but some may be done by the teacher; such teaching steps can include pupil responding and activities.)
5. Prepare necessary materials, and a written plan for the entire lesson.
6. Conduct the lesson and administer the test over the objective.
7. Use relevant data to revise the lesson.
8. Conduct the revised lesson

9. Conduct a summative evaluation of the lesson.

Design and Evaluation of a Lesson

Selecting an Objective

You need first to select a lesson objective that can be taught (including testing or other evaluation) in the time available. You need to define that objective in such a way that one of your peers, having no information but the objective, could design a suitable test (or other form of evaluation) for the objective.

There are two methods available for writing objectives in performance terms. Both of these will be mentioned briefly.

Some years ago Mager suggested that an acceptable performance objective must have three elements:

1. Given what
2. The student does what
3. How well

If you have not previously learned to write objectives following these three criteria, refer either to Mager (1962), Writing Instructional Objectives, or to Briggs, (1970), Handbook of Procedures for the Design of Instruction, pages 18-30.

Another alternative is to now take the module on writing objectives.

A second, even more demanding form of writing objectives has been proposed by Gagne and Briggs (1974). This method contains 5 rather than 3 components, as in the Mager system. The major distinction between the two systems is that the Gagne/Briggs system uses two verbs, one to show the overt action the pupil engages in during a testing situation; the quality and consistency of such actions are used to infer an internal generalized capability for performing a whole class of actions, of which the test performance is a sample. For example an action of typing a business letter, under a given simulated business situation, such as a shipping matter, if properly done, leads one to infer also the capability for composing such letters, since the letter typed was composed by the pupil, not someone else. Thus the five components are:

1. A situation -- a business letter is received which requires a reply.
2. The learner generates the letter, rather than typing a letter composed by somebody else.
3. An object -- the letter in reply which is composed and typed by the student.
4. An action -- typing the letter.

5. Tools and Constraints (the "Given" in the Mager system) -- an electric typewriter; paper and carbon paper; a one page letter is the assigned limit.

Note that the "how well" is not included as a component of the objective, as in the Mager system. Rather, the how well, or the criterion performance indicating mastery, is considered as related to the test rather than to the objective. Thus in the letter example, above, there would probably be criteria setting minimum required standards for:

- (1) Content of the letter
- (2) Accuracy, and neatness
- (3) And a time limit.

You may wish to refer to Chapter 5 of Principles of Instructional Design, Gagne and Briggs (1974), if you wish to use this method of writing your objective. So several sources are available in the event you have not had prior instruction on writing performance (behavioral) objectives.

Classifying the Objective

Having selected and written an objective in performance terms, the next step is to classify the objective according to a taxonomy. If you have had modules 5.1 and

5.3, you know that some taxonomies are for only one domain of learning, while that by Gagne and Briggs covers five domains of learning.

If your objective is in the cognitive domain, you may classify it by use of the Bloom taxonomy or by use of the Gagne/Briggs (G/B) taxonomy. If you use Bloom, you might use a classification such as "analysis", "synthesis", or "comprehension". If you use the G/B taxonomy, you may use such categories as "multiple discriminations", "concepts", or "problem solving", or "attitude".

While there may be little basis for preference between the Bloom and the G/B taxonomies for the purpose of classifying objectives or classifying test items for the purpose of designing instruction the G/B taxonomy has the advantage of concretely specifying the instructional events and conditions of learning for each domain and sub-domain of the taxonomy. Also the G/B taxonomy includes information on how to deal with structure and sequence of objectives, and how to analyze intellectual skill objectives into their subordinate competencies (enabling objectives).

For the purpose of this module, your objective for the lesson should be classifiable as representing only one type of learning. If, upon examination, it seems to require several kinds of learning, it needs to be redefined, or broken down into separate objectives, each of which

represents only one type of learning. Then you must consider whether only one of these can be taught in the time available. If time available would permit more than one objective, a separate lesson plan should be made for each, if they represent different kinds of learning, because the conditions of learning would differ between objectives.

Now review the classification of your objective, with the above points in mind. If possible, check your classification with the instructor. Also you might estimate the time needed to be ready to teach the lesson, so it can be scheduled in advance.

Designing a Performance Measure

You need a test over the objective of your lesson in order to know how well it succeeded. By "test" we mean any appropriate way of assessing the performance of the learners on the objective after the completion of instruction. This may be a written test; or a performance, such as a speech or a written report; or a product, such as a work of art. In any event write the test, or, give the directions to the pupils if a performance or a product is the way to evaluate the success of the learners. Also, prepare an answer key, or describe how the product or performance may be evaluated as "satisfactory" or "needs more study".

If you feel uncertain as to how pupil performance should be evaluated for the chosen lesson objective, you might work through pages 46-73 in Handbook of Procedures for the Design of Instruction, Briggs (1970).

Now present to the instructor:

1. The test (or directions for a performance or product)
2. The scoring key (or checklist for evaluating the performance or product)
3. A minimum standard for grading a pupil's performance as "satisfactory".
4. A design objective; a statement of what proportion of pupils must be rated "satisfactory" for you to conclude that your lesson is a success.

Planning the Lesson

If you have completed Module 5.3 you have learned how to plan a lesson for an objective by (1) Specifying the instructional events and conditions of learning and (2) how each event or condition will be accomplished.

If you have not completed module 5.3, you may want to stop work on this one and do 5.3 next. If not, you have two other choices:

(1) Read pages 97-101 in the Handbook previously mentioned. If you do this, note this dual terminology or difference between the terms used here and those in the Handbook:

Instructional Events = General Instructional Events
in Handbook

Conditions of Learning = Special Instructional Events
in Handbook

(2) If you have not had module 5.3 and do not think the few pages referred to in option 1, above, is sufficient for you to know how to use the general and special instructional events, then just make a list of "teaching steps", and continue with this module.

Preparing Necessary Materials

The remaining step in preparing to teach the lesson is to prepare all materials described in the second column of your lesson plan.

Recall that we wish you to use instructional materials to do as much of the teaching as possible because materials do not "vanish" as does a teacher activity. But for preliminaries such as relating the new lesson to prior lessons, you need not hesitate to act as "teacher". A second reason for asking you to use materials rather than teacher-conducted instruction, when possible, is that

teachers need to develop their own materials when they are not otherwise available. A third reason is that individually paced study is often better than group-paced procedures. The more a teacher can use individualized, self-paced materials, the more time he has for helping individual students and monitoring and guiding pupil progress.

When your lesson plan and all other items previously specified, including the instructional materials are ready, check them with the instructor.

As indicated above, you may organize your lesson plan around the general and specific instructional events listed in the Handbook, or you may organize it around your list of "teaching steps".

The next step is to give a brief description of the materials, methods, and student activities for the lesson. This can be done in a two column format used for the sample lesson plan in Module 5.3. This format is:

<u>Event (Teaching Step)</u>	<u>How accomplished</u>
1. Stating the objective of the lesson	1. To be written on chalk-board by the teacher
2. Presenting a model of desired performance	2. Teacher demonstrates a correct performance of the objective

- | | |
|---|---|
| 3. Stimulate relevant recall | 3. Review test and remedial programmed text |
| 4. Present the stimulus; provide feedback | 4. Written text and self-test questions, with answer key (contains all new information needed for mastery of the objective) |
| 5. Assess attainments | 5. Administer and score the evaluation test or exercise. |

Conducting the Lesson and Administering the Test

The lesson plan has been the vehicle for your preparation to conduct the lesson. You will want to be sure to review it as a check on all materials you should take.

Don't forget the test. This lesson you are teaching is for the purpose of learning to do a formative evaluation, and the test is a crucial way of gathering data for this purpose.

However the test is not the only way to gather information helpful in revising your lesson. Some other sources are:

1. Watch and listen. When you are not conducting a teaching step yourself, and are not engaged with an individual student, keep alert for signs of restlessness, inattention, puzzlement, or unwillingness to do the assigned

study and exercises built into the materials. Also look for signs of enjoyment of the lesson. If pupils say "I liked this part". or "I didn't understand this part", make a note of it.

2. Check answers to any self-tests, exercises, or programmed booklets. Even though such questions are designed to help the student learn, not to evaluate him, any errors made by large numbers of pupils suggest need for revision of the materials or the questions.

3. After the test has been given, if time permits, ask students which parts were difficult, easy, dull, or interesting.

4. Consider a brief questionnaire covering some of the good points.

5. Explain that you are going to use their test scores and comments to revise the lesson to make it better. Ask them to give suggestions as to how to do this.

Revising the Lesson

Do an item analysis of your test as well as recording a score for each pupil. You need both kinds of data to answer two separate questions:

1. How well did the lesson work? To answer this question, you note how many pupils met the standard for

"satisfactory" on the test. You also consider pupil reactions.

2. Where does the lesson need improvement? Here is where you want to know how many pupils missed each question on the test. If many pupils miss a question, revise the part of the lesson (or materials) which dealt with that question.

Using all information available, revise the lesson and materials and prepare for teaching the lesson to another group.

Teaching the Revised Lesson

Follow the same overall procedures as in the first teaching of the lesson, except for changes you made during the revision of your plans and materials. Administer test instruments as before.

Conducting a Summative Evaluation

This amounts to asking:

1. Did I reach my design objective in terms of number of students getting "satisfactory" on the test?

2. Did my revision help? Compare the two sets of results for this.

3. What changes are still needed? Use the item analysis and other information for this.