

## REFERENCES.

- (1) Clendening, L. T., "Methods of Treatment," 5th Edition, pages 398-399.
- (2) Goldsmith, S., and Dayton, A. B., "Studies in the Mechanism of Absorption from Intestines," *Am. J. Physiol.*, 48, 419 (1919).
- (3) Soper, H. W., "The Enema and Colonic Lavage," *Arch. Phys. Therapy*, 15, 487-489 (1934).
- (4) Hirschman, L. J., "Enemas, Some of Their Uses and Abuses," *J. A. M. A.*, 89, 1039-1040 (1927).
- (5) Culbreth, D. M. R., "A Manual of Materia Medica and Pharmacology," 7th Edition, page 853 (1927).
- (6) Army, H. V., "Formula Compendium," page 21 (1936).

---

### SOME OBSERVATIONS ON THE USE OF OBJECTIVE TESTS IN PHARMACY.\*

BY LYMAN D. FONDA.<sup>1</sup>

Modern educational theory advances the proposition that besides serving as a basis for selection, examinations should: (1) act as learning exercises and motivate the student to further effort, (2) enable the instructor to judge how closely learning is actually paralleling teaching, (3) aid the instructor in determining whether students have properly attained the objectives set up for the course. Experience in the fields of elementary and secondary education has demonstrated that the traditional essay examination is not adequate as a testing instrument for these purposes. While it is probably the best form of examination yet devised for some purposes, the essay examination offers several disadvantages in a program such as was outlined above. Of these, probably the most important are the highly subjective rating of essay tests and the fact that they are not customarily scaled finely enough to make their results entirely comparable.

In the light of these facts we determined several years ago to attempt the use of objective examinations as a teaching device in pharmacy. At the same time, we have continued to use the essay examinations in our mid-year and final examinations. These new type examinations are truly objective only in the provisions which they make for impartial scoring. Considering this, and in view of the fact that no examination is more valid than the basic assumptions upon which it is constructed, we felt that our first step should be a reformulation of our course aims in terms of minor objectives. Accordingly under the three headings of: (1) factual knowledge objectives, (2) ability to use facts in reasoning, (3) ability to locate and use desired information, we grouped a formidable array of specific objectives. These were gathered from such sources as: Charter's Basic Material for a Pharmaceutical Curriculum, the New York State Pharmacal Syllabus, the National Syllabus, various textbooks, and prescription ingredient surveys. From these lists we have constructed our new type tests.

At one time or another we have attempted to utilize all of the types and modifications of objective tests which we have found in various standardized tests and in literature. For the past two years, however, we have been limiting ourselves to variations of the Matching, Multiple Choice and Completion items. We felt that

---

\* Section on Practical Pharmacy and Dispensing, A. Ph. A., New York meeting, 1937.

<sup>1</sup> Professor of Pharmacy, Long Island University, Brooklyn College of Pharmacy.

the validity of the True-False type was questionable and such items offered particular difficulty in construction in order to prevent ambiguity and the danger of offering leads. Each examination must of course contain a majority of items which test for factual knowledge. However, we have consistently attempted to include a considerable number of items which are designed to test the ability of the student to reason and apply factual knowledge to a problem situation. In obtaining such items we have adopted a policy of utilizing problem situations, from laboratory or drug store practice, which have already been discussed in a class at some time or other and a record kept of the student responses. All of us have acquired the habit of recording such responses to questions, so that we now have a file of notes from which to select test items. By the use of this technique, we feel that our tests are becoming more valid and reliable, since we are utilizing responses which students actually make, rather than those which an instructor thinks they might make. Occasionally we give an open book examination in which the students are permitted to utilize textbooks in search for information necessary to the solution of the prescription incompatibility or other problems involved.

The time required for the construction of these objective examinations is far more than for the usual essay test. We found that from four to five hours were required for the construction of nearly every test when we first started. As our file of test items has increased, and we developed more skill in their preparation, this has been cut down until we now feel that an hour or two is sufficient to make out a test. If we use items from other tests and do not attempt to devise new ones, we can construct a test in about one-half hour. Accordingly, we feel that as we obtain a more complete file of proved items, the labor of test construction will be reduced to reasonable limits. Even at present, the time spent in the construction, administration and rating of an objective test compares favorably with that required for an essay examination when one considers the rapidity with which an objective test can be scored.

It has been our habit to administer monthly tests which cover, very thoroughly, the work of the past month. In addition to these, about every two months, we give a general review test which contains a representative sampling of the work of the entire course to date. For the monthly tests we customarily allow a 50-minute period, and for the general review tests from 50 to 70 minutes usually suffice. All examinations are returned to the student after they have been scored, and a portion of a class period is devoted to a general discussion of the test.

The student reaction to this program has been extremely favorable. For the first two years, we utilized these tests with only our second- and third-year classes. Early in the second year we began to have requests from Freshmen for tests of a similar nature, and many of our second-year students told us they felt that such a testing program would have helped them in their first year. The question of continuing the tests or discontinuing them in favor of more time for oral quiz and discussion has been submitted to a vote in various classes on three different occasions. In each case over 80% of the class has voted to continue the tests. Since these questionnaires were not marked for identification, we presume that this represents the honest opinion of the student body. By the same method, the students have indicated the following reactions: (1) It is necessary to study more for a series of monthly objective tests than for a like number of essay examinations. Students

admitted a tendency to "take a chance" and try and "get by" on essay tests but felt that this was impossible with the more comprehensive objective examinations. (2) Students felt that a great deal of memorizing was necessary for the objective examinations but admitted that this was no more than would be necessary, in any event, if they wished to master the subject-matter of the course. (3) They expressed the opinion that the new-type test motivated them to acquire more regular study habits because of the variety and number of questions. (4) On each of the questionnaires, approximately 85% of the students expressed themselves as feeling much better prepared and more self-confident in the semester final examinations than they would have been without such a series of objective tests.

In attempting to evaluate the possible results of this program, we have made several interesting observations. A comparison of the results of semester examinations of classes before we began the use of these tests, with those of classes which have had the tests, shows two differences. *First*, the range of distribution is more compact and there is a marked decrease in the extremely low grades since this program has been in effect. *Secondly*, the median grade has been consistently higher with classes which have had these tests. Computation of the Critical Ratio has shown that in 90% of the cases studied, this difference in median grade has been sufficient, so that it could not be reasonably attributed to chance fluctuations alone.

A comparison of the results of the semester examinations of individual classes for the year when they did not have the tests, with the results of the second year, after they had had this program, showed the same two differences (*i. e.*, decrease in spread and increase in median grade). This might be of questionable significance in itself, since it might be due to increased comprehension and greater familiarity with the work. In view of the fact that a comparison of examination results of classes before the new program was instituted did not show such marked differences, perhaps this may be taken as another indication of the trend.

Correlation of the results of various classes on these objective tests has been consistently high. The fact that we have been constantly changing test items and have, to date, made no attempt to develop standard tests, perhaps detracts from the significance of these correlations. In two cases we converted the objective test scores to percentile grades and correlated these with the results of the same class in the semester essay examination. In both cases, the correlation was surprisingly high. This may well have been accidental but presents a possibility which we are going to investigate more fully in the future.

In conclusion, it is the consensus of our instructor's opinion that the objective tests do offer a teaching device of very considerable merit. Our experience leads us to make the following summary of observations:

- (1) Objective tests, at regular intervals, do offer a means by which the instructor in pharmacy may:
  - (a) Stimulate study and review
  - (b) Determine approximately how closely learning is paralleling teaching
  - (c) Check on the attainment of course objectives.
- (2) Both the essay examination and the objective tests should probably be used in a well-balanced testing program.
- (3) The total time required to construct, administer and score objective tests is probably about the same as for essay examinations after one has acquired the experience and skill requisite to the rapid construction of the objective tests,