

PSYCHOMETRICS AS AN AID TO CURRICULUM DEVELOPMENT

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FOR the past few years there has been much debate in the professional education literature concerning a national assessment,^{1, 2} external testing programs,³ and outright misuse of test results.⁴ In a recent article dealing with this conflict, Yamamoto⁵ categorized the arguments into three general charges: (a) inadequacy of the instruments of measurement, (b) misuse of the test results, and (c) infringement upon testees' right to privacy.

With such a confused and even hostile climate, it may appear foolhardy to attempt to write an article on such a topic. It does appear, however, that wisely used, a variety of psychometric devices can be of material assistance to professionals who are involved in

curriculum development. The reader may want to acquaint himself with the pros and cons outlined in the articles mentioned above as he evaluates his own thoughts on the use of psychometrics.

Ideally, in most subject areas, curriculum development should be carried out on a K-12 basis. Curriculum development projects should start with the kindergarten and move up one year at a time so that an adequate sample of students can be involved each year and the materials modified in order that maximum results can be obtained for the population under consideration. When such a process is used for curriculum development, many of the shortcomings which have arisen from projects which started at the junior high school level and which then attempted to move in both directions are avoided.

When a new course is developed for the junior high school, it must assume a lack of student background that will not be true after courses are developed for the elementary grades. After the elementary program is developed, the junior high course would need to be

¹ Harold C. Hand. "National Assessment Viewed as the Camel's Nose." *Phi Delta Kappan* 47: 8-13; September 1965.

² Ralph W. Tyler. "Assessing the Progress of Education." *Phi Delta Kappan* 47: 13-16; September 1965.

³ Joint Committee on Testing. *Testing Testing Testing*. Washington, D.C.: Published by AASA, CCSSO, and NASSP, 1962.

⁴ Stanley E. Ballinger. "Of Testing and Its Tyranny." *Phi Delta Kappan* 44: 176-80; January 1963.

⁵ Kaoru Yamamoto. "Psychological Testing: Invasion of Privacy?" *Educational Leadership* 23: 363-68; February 1966.

revised as well as any senior high course that had been built on the junior high course alone.

For purposes of illustration, in this article we will assume that arithmetic materials have been developed up through fourth grade and we are now ready to prepare curriculum materials in arithmetic for the fifth grade. To further set the ground rules we will assume that when a curriculum or course of study is developed it is usually developed for a rather specific group. During most of our educational history, it has been the practice to develop curriculum materials for the total population at a given grade or age level, but during the past few years, curriculum developers have started to design curricula for the less able, the average, or the more able pupil. Yet even if a given grade is divided into these three so-called ability groups, we still will identify a group of students (hereafter called the target group) and develop a particular curriculum for them.

As used in this article, psychometrics refers to all types of test instruments, observations, questionnaires, and other techniques used to collect data and information about the students in the target group being considered. Horrocks⁶ writes, "Psychological measurement is the appraisal of human behavior. It involves the attaining of information that enables us to make judgments about the present status of individuals and of groups." Horrocks⁷ categorizes tests as measures "of (a)

intelligence or general ability and maturation, (b) aptitude or special ability, (c) achievement, (d) interest, (e) attitude and opinion, (f) personality and temperament, (g) social interaction, (h) physical and sensory capacity, and (i) motor ability."

Within the limitations set by the psychometrics used to define the target group, we are able to say that the descriptions as provided do describe their general and specific abilities, interests, attitudes, needs and their present level of achievement and that, from this information, the curriculum developers can begin to determine what this group needs in this particular year's curriculum.

Establishing Objectives

The first step in curriculum development (this should have been done before the kindergarten arithmetic curriculum was started) is the formulation by the local Board of Education of broad school policies and the general objectives of the total educational program. The superintendent and his professional staff will give assistance to the board when it is requested. The decisions of the board may also, in part, be governed by state regulations or laws.

The professional staff working within the limits of the board policies and objectives prepares more specific and detailed objectives around which the various areas of the curriculum are built. In our case they would have spelled out specific objectives in arithmetic K-12 and would review the objectives for fifth grade after they have studied results obtained kindergarten through fourth grade. Goodlad and

⁶ John E. Horrocks. *Assessment of Behavior*. Columbus: Charles E. Merrill Books, Inc., 1964. p. 15.

⁷ John E. Horrocks. *Ibid.*, p. 77.

Klein⁸ and Ammons⁹ indicate that many school systems have not been very effective in this area of their responsibilities. It seems apparent that effective curriculum design depends, in part, on the quality of objectives outlined. While the selection of objectives is largely value oriented, questionnaires could be used to sample the reactions of a large number of lay citizens and professional teachers to arrive at the most acceptable objectives.

Once the specific objectives have been selected (wherever possible they should be stated in terms of observable student behavior), the process of writing curriculum materials can begin. At this stage a review of test results or the observation of how students attack their work in arithmetic will give the writers clues about how the materials should be written. The materials should include a variety of opportunities for educational experiences designed to help the student reach the specific objectives outlined.

After the materials for the fifth grade are completed (they could be developed unit by unit, which would be preferable to a total year's work but very time-consuming), they are presented to pilot groups. Diagnostic tests and observations of student work and reactions during and at the end of each unit will give the curriculum workers clues for modification.

Probably one of the most important

⁸John I. Goodlad and M. Frances Klein. "What's Happening in Curriculum Development?" *Nation's Schools* 77(4): 70-73; April 1966.

⁹Margaret Ammons. "An Empirical Study of Process and Product in Curriculum Development." *Journal of Educational Research* 57: 451-57; May-June 1964.

facts that psychometric devices have revealed to us is the fact of individual differences. We have known for many years about the bell shaped curve and the wide distribution of aptitudes, skills, abilities, physical energy and other traits but we have steadfastly continued to develop one course of study for a given grade level. Some courses have included some variations in opportunities for experiences to take care of high, average and low groups but the attempts have fallen short of really satisfying individual needs.

Individual Differences

Individual differences among the children in any group are of significance to the curriculum planner and must be considered. At best the curriculum planner can hope to hit a limited range of abilities, interests and needs but the teacher who knows the individual children will have to finish the tailoring process for them. Hunter¹⁰ suggests a very sound approach to looking at the curriculum (daily learning task) for the individual student. She writes ". . . diagnosis has become an intensive part of the teaching act for all learners. Out of such diagnosis are created educational prescriptions. The repertoire of competence of the teachers and alternatives offered by the school constitutes a pharmacy from which such prescriptions are filled." A basic course outline with a wide variety of educational experiences may be the kind of course that is dictated by the fact of individual differences.

A relatively new area that Combs

¹⁰Madeline Hunter. "When the Teacher Diagnoses Learning." *Educational Leadership* 23: 545-49; April 1966.

and others have been pointing out is the importance to the teacher of the self-concept of each student.¹¹ It is difficult to measure by the instruments presently available but a combination of projective devices, observation by trained observers, and structured interviews can give us some ideas of how the student sees himself, the world around him and his relationship to that world. The teacher should take the student's self-concept into account as he modifies a given course of study to meet his personal and individual needs.

To obtain an entirely different perspective on our topic, we will turn briefly to *programmed instruction* materials where we can observe an effective use of continuous testing to improve a program. It is generally accepted that each item should be answered correctly by nearly all students responding. If this is not the case during use in a pilot class, the item is reviewed to see if the step is too big or if it is ambiguous. If either is the case, the item is refined and tested again. This continuous testing accounts for the success of many of the programmed textbooks when students are motivated to use them properly. A good review of programmed instruction can be found in the March 1963 issue of the *Phi Delta Kappan*.

We have looked briefly at the use of psychometrics as an aid to curriculum development. We have suggested that psychometrics could be used to describe the target group, to diagnose

achievement during the use of the materials in the pilot classes before needed modification of the materials is made, and finally to measure achievement in the pilot classes so that we have the good description necessary to move on to the next target group.

Implications

The following additional suggestions are made as a result of the review of the writings that served as a background for this article. They constitute a partial guideline for what the curriculum workers of today need to make their work effective. A curriculum worker should:

1. Have as a part of his educational background a thorough working knowledge of psychological measurements and statistics. This knowledge will enable him to make sounder use of data obtained.

2. Make use of a wider range of instruments than is typical today. The innovational instruments of the Eight-Year Study and the type of evaluation items described in Bloom's two *Taxonomies of Educational Objectives* should provide a good beginning place. Yet new and imaginative thinking is needed in the further development of evaluative instruments.

3. Develop courses in a sequential order starting with the kindergarten. Ideally, work should proceed grade level by grade level, spending enough time at each grade level to assure the writers that optimum results were at least possible with the materials developed. Practically it may be necessary to develop two or three years at a time. ❧

¹¹ Arthur W. Combs, chairman, ASCD Yearbook Committee. *Perceiving, Behaving, Becoming: A New Focus for Education*. Washington, D.C.: Association for Supervision and Curriculum Development, 1962.

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