

## CHAPTER XV

## SUMMARY AND CONCLUSIONS

This treatise gives a complete report of the procedure adopted in the construction and standardisation of the "Aptitude Test for Secondary School Teachers".

## THE TEST

Out of a number of factors that are supposed to be indicative of the aptitude for teaching, the following five factors were finally selected for the present study.

- (1) Attitude towards children.
- (2) Mental ability.
- (3) Interest in Profession.
- (4) Adaptability.
- (5) Professional information.

A number of investigations have been carried out on this topic under different titles such as: 'Predicting Teacher Success'; 'Pre-Training Factors Predictive of Teacher Success'; 'Forecasting Teaching Ability'; 'Measuring Teaching Aptitude'; etc. All such investigations include tests to measure all or some of these factors. Almost all the investigators have concluded that sound knowledge of the subject-matter is an

essential pre-requisite for success in teaching. Most of them also put stress on teacher's sound health, sincerity and industry for his becoming successful in teaching. After a thorough discussion with the experts and a careful scrutiny of all the factors, indicative of success in teaching, revealed through the studies of a number of investigators, the present test constructor selected the above mentioned factors to measure the aptitude for teaching.

The most important factor - "sound knowledge of subject matter" - is excluded from the above list for the reasons discussed in chapter No.VI, on Test Construction. The factors of health, sincerity and industry are also excluded for similar reasons. Even then the investigator strongly feels that through some convenient measure the testee's knowledge of subject matter should be tested before any decision is taken as to his aptitude for teaching on the basis of the present test-results. To be more careful and exact, through an adequate paper-pencil personality test or through an interview, the testee's sincerity and industry also should be ascertained. The medical inspection should have declared him physically fit for the profession.

The whole test, then, consists of the following five sub-tests.

- (1) Attitude Towards Children (35-items)
- (2) Mental Ability (26-items)

(3) Interest in Profession (9-items).

(4) Adaptability (20-items).

(5) Professional Information (30-items).

In all, there are 120 items in the whole test.

#### THE POPULATION

The population includes all University graduates - men and women - who are eligible to serve as teachers in secondary schools.

A sample was drawn from this population for the construction and standardisation of the present test.

#### THE SAMPLE

The total sample for the present test consists of 530 men and women graduates or post-graduates. Newly admitted pupil-teachers in the different colleges formed the total sample.

#### MODE OF ADMINISTERING THE TEST AND INSTRUCTIONS

How to administer the final test is discussed at length in chapter No. VIII.

The standardised instructions are printed on the front page of the test-booklet. The oral instructions to be given at the time of administering the test are given in chapter No. VII as well as in Appendix I.

**TIME LIMIT**

There is no time limit for administering the test. The testees are to be given as much time as they require in giving responses to all the 120 items. The test-administrator should take care to see that no testee omits any item.

**SCORING**

No correction was applied for guessing while scoring test items.

The maximum obtainable score on the test is 132.

**SUMMARY OF RESULTS**

(1) The difficulty values and internal - consistency indices of all the 120 items included in the final test are given in table No. 11 on page No. 192.

(2) The total sample consists of 530 men and women graduates, i.e.  $N = 530$ .

(3) The highest score that is obtained on the test is 102, while the lowest score is 53. The range between the highest and the lowest scores is, therefore,  $(102 - 53) + 1 = 50$ .

(4) The mean, the median and the standard deviation for the whole sample are:

Mean = 79.09

Median = 79.778

and SD = 9.27

(5) The nature of the distribution of the test scores was studied in three ways.:

(a) Through measures of divergence:

The measures of divergence are skewness and kurtosis.

$Sk = -0.223$  (by formula, A), or

$Sk = -1.205$  (by formula, B).

The type of the skewness is negative.

$Ku = 0.251$

The type of kurtosis is leptokurtic.

Both these divergences are not significant and the distribution is nearly normal.

(b) Through chi-square test:

$\chi^2 = 8.5559$ .

This is not significant at both the levels of significance. This also testifies to the normality of the score distribution.

(c) Through the best-fitting normal distribution curve for the test-scores.

The normal curve obtained is shown on page No. 282  
This also proves that the distribution is much more nearly normal.

The distribution of the test score is, thus, taken as normal.

(6) The reliability of the test was estimated by the following three methods.

- (i) Split-half method.
- (ii) Hoyt's method.
- & (iii) K-R formula, 20.

The results obtained by the use of different methods are given below:

(i) 'Split-half' method:	0.878 ± 0.011
(ii) Hoyt's method:	0.802
(iii) K-R formula, 20:	0.803

The reliability of the present test is fixed up to be 0.80.

(7) The validity of the test was estimated by correlating the test-scores with the criterion scores. This gave predictive validity of the test. It is 0.502 ± 0.026.

(8) The results obtained from the application of the "Wherry-Doolittle Test-selection method" suggested that test III - "Interest in Profession" - be discarded from the final test battery.

The multiple, R, of the final test-battery is 0.533.

The "shrunken" multiple correlation coefficient,  $\bar{R}$ , is 0.527.

The multiple-regression equation joining the criterion and the tests selected in the final battery reads as follows:

$$\bar{X}_c = 0.32X_2 + 0.51X_1 + 0.29X_4 + 0.16X_5 + 32.11$$

If the scores on tests, II, I, IV and V are known, the criterion score can be computed with the help of this equation. The equation may be termed the "prediction equation". It helps in forecasting success in teaching of a prospective teacher.

(9) Thurstone's centroid method of factor analysis was applied to the test data. The factor analysis revealed the presence of one factor. The extracted factor is a common factor for the test-battery.

(10) The following types of norms are established for the present test.

- (a) Standard-score norms.
- (b) T-score norms.
- (c) Percentile norms.
- (d) Letter grades.

#### FORECASTING ABILITY OF THE TEST BATTERY

The ultimate purpose of using aptitude tests is to estimate or forecast aptitudes from test scores.

It is necessary to know how far the forecast, regarding success in teaching made by the prediction equation given above, turns out to be true. When the multiple correlation,  $R$ , is known, the forecasting efficiency of a test-battery is given by the following formula:

$$E = 1 - \sqrt{1 - R^2}$$

Where  $E$  = forecasting efficiency

$R$  = multiple correlation.

In the present case,  $R = 0.533$ .

$$\begin{aligned} \therefore E &= 1 - \sqrt{1 - (0.533)^2} \\ &= 1 - 0.8449 \\ &= 0.1551 \\ &= 0.16 \text{ (approximately)} \end{aligned}$$

The forecasting efficiency of the present test is, therefore, 16 per cent. Apparently the forecasting efficiency of the test-battery is low. But it should be noted that the zone of forecasting efficiency between 10 per cent and 30 per cent is the zone where practically all modern aptitude correlations fall. Hull<sup>1</sup> says,

Under ordinary conditions it seems likely that tests having a forecasting efficiency below about 10 per cent would not be worth using. This means that batteries correlating below 0.45 or 0.50 with a true criterion will hardly be

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<sup>1</sup> Hull, C. L., "Aptitude Testing", Yonker's World Book Co., 1928, p. 275.

useful unless they are extremely inexpensive. At the other extreme, correlations on genuine aptitudes running above 0.70 or 0.75 are so rare at present as to be practically non-existent.

Considering this fact, it may be said that the 16 per cent forecasting efficiency of the present test is something better than nothing. It serves some useful purpose of predicting success in the teaching of a prospective teacher.

POSITION OF SUB-TEST III - INTEREST IN  
PROFESSION - IN THE BATTERY

It is seen that the sub-test III does not add to the multiple coefficient of correlation,  $R$ , at all. It suggests, therefore, that the sub-test should not be included in the test-battery. How this sub-test correlates with other tests is shown in table No. 93.

TABLE NO. 93  
 SUB-TEST III CORRELATED WITH THE REMAINING  
 TESTS

Sample	-	I	II	IV	V
Total sample	III	0.201	0.129	0.186	0.151
Unit A	III	0.076	0.045	0.294	0.150
Unit B	III	0.188	-0.266	-0.011	-0.023
Unit C	III	0.009	0.358	0.087	0.119
Unit D	III	0.411	0.119	0.220	0.282
Unit E	III	0.075	0.190	0.130	0.285
Unit F	III	0.164	0.116	0.185	0.044

An attempt was made to see whether the sub-test III acts as a "suppressor" variable. A suppressor test takes out some "non-valid" variance from the test for which it acts as a suppressor. It, thus, raises the criterion correlation of the battery. It shows a high correlation with the test for which it is a suppressor but a low correlation with the criterion. This type of test enters into a composite prediction with a negative weight.

The coefficient of correlation between sub-test III and the criterion is  $0.100 \pm 0.035$ . This is definitely a low one. But the sub-test III does not correlate exceptionally high with any of the remaining four tests. It is, therefore, concluded that the sub-test III does not act as a suppressor

variable.

A plausible solution to this situation is that the sub-test III may not be eliminated from the test-battery. It may be administered along with the other tests in the battery. The test norms are established from the raw scores which include the scores on sub-test III. It is, therefore, essential that this test should be included in the final test-battery. If this sub-test is excluded from the battery and if the scores on this sub-test are not taken into consideration along with the scores on other tests, the test norms established will be uncomparable and thus rendered useless. But it should be assigned zero weightage as the sub-test does not add to the predicting validity of the test battery. Thus no change will be needed in the forecasting equation (multiple-regression equation) established earlier. The inclusion or the exclusion of sub-test III in the test-battery, thus, will not apparently affect the forecasting equation. It will remain the same in any case.

#### CONCLUSIONS

(1) The five factors selected in the beginning tentatively are really contributing to the success in teaching and to that extent they measure aptitude for teaching.

(2) The sub-test III is proved weak. Even then interest in profession is one of the most important factors contributing to success in teaching. It may be that some of

the testees are unwilling to show their minds clearly as to their interest in profession. The desirable results are, therefore, not obtained and the effectiveness of the sub-test is reduced to such an extent.

(3) The information about testee's aptitude for teaching obtained through the test-battery should be supplemented by information about his knowledge of subject-matter, health, sincerity and industry before the final decision is taken as to his real aptitude for teaching.

(4) The fact that the distribution of the test-score is normal, suggests that the aptitude for teaching as a whole has a normal distribution.

(5) The reliability and validity of the test are satisfactory and the test serves a useful purpose of measuring aptitude for teaching of a prospective teacher.

(6) The forecasting ability of the test-battery is 16 per cent. This is to some extent satisfactory as discussed earlier.

(7) The final test-battery should include all the five sub-tests. But the sub-test III is to be given zero weightage, while using "prediction equation", thus eliminating it from the multiple-regression equation established to predict success in teaching.

(8) The classification of testees according to letter

-grades is shown below:

TABLE NO. 94

CLASSIFICATION OF TESTEES ACCORDING TO LETTER GRADES

Letter grade	Limits of raw scores	Frequency
A	99 and above	9
B	Between 91 and 98	45
C <sup>+</sup>	Between 83 and 90	133
C	Between 75 and 82	186
C <sup>-</sup>	Between 67 and 74	104
D	Between 59 and 66	44
E	58 and below	9
N =		530

Grade A suggests that testees who are assigned this grade possess very high aptitude for teaching and that they would make excellent teachers. One would unhesitatingly recommend such teachers for vacancies suitable to their capacities. While grade E suggests that testees who are assigned this grade possess extremely low aptitude for teaching and that they would make very poor teachers. Such teachers should be eliminated from the beginning. It will be advisable, therefore, to reject a prospective teacher who scores, on this aptitude test, 58 or below as he should be considered unacceptable to the profession.

In selecting teachers care should be taken to eliminate poor teachers from the beginning.

Grades B, C<sup>+</sup>, C, C<sup>-</sup> and D indicate decreasing magnitude of aptitude for teaching possessed by the testees.

Sandiford and others also suggest,

Any method of restriction of the number of pupil-teachers must be based on elimination of the least fit if it is to benefit education.<sup>1</sup>

In an article<sup>2</sup> on "Teacher Education" in the concluding statement, Sanford and Trump write,

A valid and reliable criterion of teaching success has not been found, the factors conditioning success in teaching are not definitely known, and a satisfactory technique of investigation for applying the criterion and the factors has not been formulated.

The complete report of the present study would show how much effort is made to make it as much scientific and comprehensive as possible. In spite of this it cannot be claimed that it is perfect and above any improvement.

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1 Sandiford, Peter, Cameron, M.A., Conway, C.B. & Long, J.A., "Forecasting Teaching Ability", Department of Educational Research, University of Toronto, Toronto-5, 1937, p. 29.

2 Monroe, W.S., "Encyclopedia of Educational Research", The MacMillan Company, New York, 1956, p. 1394.