Difficulty and Discriminating Indices

Basuki Nath Jha(B.Ed)

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Godda College Godda

Item analysis refers to a mixed group of statistics that are computed for each item on a test. The item analysis helps to determine the role of each items with respect to the entire test. The main purpose of item analysis is to improve tests by revising or eliminating ineffective items. Item analysis can provide important diagnostic information on what examinees have learned and what they have not learned. There are many different procedures for determining item analysis. The procedure employed in evaluating an item's effectiveness depends to some extent on the researcher's preference and on the purpose of the test. Item analysis of a test comes after the preliminary draft of a test has been constructed, administered on a sample and scored out. Tabulation is done to determine the following two important characteristics of each item.

1. Level of Difficulty or item difficulty, and
2. Discriminating power of the test items or item discrimination

The above two indices help in item selection for the final draft of the test.

Item Difficulty

Item difficulty may be defined as the proportion of the examinees that marked the item correctly. Item difficulty is the percentage of students that correctly answered the item, also referred to as the p-value. The range is from 0% to 100%, the higher the value, the easier the item. P values above 0.90 are very easy items and might be a concept not worth testing. P-values below 0.20 indicate difficult items and should be reviewed for possible confusing language or the contents needs re-instruction. Optimum difficulty level is 0.50 for maximum discrimination between high and low achievers. For example an item answered correctly by 70% examinees has a difficulty index of 0.70. If 90% of a standard group pass an item, it is easy; if only 10% pass, the item is hard or too difficult. Generally, items of moderate difficulty are to be preferred to those which are much easier or much harder.

The following formula is used to find difficulty level.

$$DL = Ru + Rl/Nu + Nl$$

Where,

Ru = the number students in the upper group who responded correctly

Rl = the number students in the lower group who responded correctly

Nu= Number of students in the upper group

Nl= Number of students in the lower group

Item Discrimination:

Item discrimination or the discriminating power of a test item refers to the degree to which success or failure on an item indicates possession of the ability being measured. It determines the extent to which the given item discriminates among examinees in the function or ability measured by the item. This value ranges between 0.0 and 1.00. Higher the value, more discrimination of the item is. A highly discriminating item indicates that the students who had high tests scores got the item correct whereas students who had low test scores got the item incorrect.

Discrimination power is estimated using the following formula:

$$DP = RU\text{-}RL/NU(or)NL$$

The procedure involves the following steps:

1. Administration of the draft test on a sample of about 200
2. Identification of upper 27% and lower 27% examinees having highest and lowest scores in rank order respectively on the total test.
3. Calculation of each item, of the proportion of the examinees attempting it correctly.
4. The discrimination index, DI will be given by using above mentioned formula
5. The DI can be tested for significance by using a critical ration test and items with positive and significant differences retained.
6. The value of the discrimination index can range from -1.00 to +1.00.

7. Items having negative discrimination are rejected. Items having discrimination index above .20 are ordinarily regarded satisfactory for use in most tests of academic achievement.

The End