

Item Analysis - Quizzes

This table presents processed quiz data in a way suitable for analyzing and judging the performance of each question for the function of assessment. The statistical parameters used are calculated as explained by classical test theory (ref. 1)

Facility Index (% Correct)

This is a measure of how easy or difficult is a question for quiz-takers. It is calculated as:

FI = $(X_{\text{average}}) / X_{\text{max}}$ where X_{average} is the mean credit obtained by all users attempting the item, and X_{max} is the maximum credit achievable for that item. If questions can be distributed dichotomically into correct / incorrect categories, this parameter coincides with the percentage of users that answer the question correctly.

Standard Deviation (SD)

This parameter measures the spread of answers in the response population. If all users answers the same, then $SD=0$. SD is calculated as the statistical standard deviation for the sample of fractional scores (achieved/maximum) at each particular question.

Discrimination Index (DI)

This provides a rough indicator of the performance of each item to separate proficient vs. less-proficient users. This parameter is calculated by first dividing learners into thirds based on the overall score in the quiz. Then the average score at the analyzed item is calculated for the groups of top and bottom performers, and the average scored subtracted. The mathematical expression is:

$$DI = (X_{\text{top}} - X_{\text{bottom}}) / N$$

where X_{top} is the sum of the fractional credit (achieved/maximum) obtained at this item by the 1/3 of users having the highest grades in the whole quiz (i.e. number of correct responses in this group), and X_{bottom} is the analog sum for users with the lower 1/3 grades for the whole quiz.

This parameter can take values between +1 and -1. If the index goes below 0.0 it means that more of the weaker learners got the item right than the stronger learners. Such items should be discarded as worthless. In fact, they reduce the accuracy of the overall score for the quiz.

Discrimination Coefficient (DC)

This is another measure of the separating power of the item to distinguish proficient from weak learners. The discrimination coefficient is a correlation coefficient between scores at the item and at the whole quiz. Here it is calculated as:

$$DC = \text{Sum}(xy) / (N * s_x * s_y)$$

where $\text{Sum}(xy)$ is the sum of the products of deviations for item scores and overall quiz scores,

N is the number of responses given to this question

s_x is the standard deviation of fractional scores for this question and,

s_y is the standard deviation of scores at the quiz as a whole.

Again, this parameter can take values between +1 and -1. Positive values indicate items that do discriminate proficient learners, whereas negative indices mark items that are answered best by those with lowest grades. Items with negative DC are answered incorrectly by the seasoned learners and thus they are actually a penalty against the most proficient learners. Those items should be avoided.

The advantage of Discrimination Coefficient vs. Discrimination Index is that the former uses information from the whole population of learners, not just the extreme upper and lower thirds. Thus, this parameter may be more sensitive to detect item performance.