

Activity: Test Item Analysis

1. Item analysis for tests consists of three components:

- **Item difficulty**, or the proportion of students answering an item correctly; the higher the proportion answering correctly, the less difficult the item (e.g., $P = .75$ means 75% of students answered the item correctly).
- **Item discrimination**, or how well the item distinguishes between those who do well on the test and those who do not do as well as determined by their overall test grade.
- **Distractor analysis**, an analysis of the incorrect responses with multiple-choice items to learn whether patterns of misunderstanding or errors in test construction can be identified.

2. Activity Materials

- Fifth Grade Science Test Results (file labeled EDUR-8331-05-Item-Analysis-Test-Results.pdf)
 - This is a set of 16 science tests from an actual fifth grade class. There are 16 tests; use only the first 8 items from each of the 16 tests. More instruction on what to do with this information follows.
 - The correct responses for these items are:
 - 1. B
 - 2. B
 - 3. A
 - 4. A
 - 5. D
 - 6. A
 - 7. D
 - 8. C
 - The teacher who scored these items circled the entire correct response if a student missed a given item.
 - To help identify incorrect responses, a red X has been placed next to those items.
- Fifth Grade Science Data Recording
 - Use this Excel sheet to record data from the first 8 items of the 16 science tests. If you don't have Excel contact me and I will provide a version on Google Sheets.

3. What to Do

Calculate a difficulty and discrimination index, and perform a distractor analysis, for each item.

- For each student's test, indicate the response to each of the first 8 items on the Excel file. Student 1's responses are entered on the spreadsheet as an example, as are the data for all tests for Item 1.
 - Note that the letter of the response chosen for each item is entered in row 5 of the spreadsheet for Student/Test 1.
 - Note, too, that the responses for all students/tests for Item 1 are entered in Column C.
 - Note that if the response is incorrect an X is placed in the "C/I" [for correct/incorrect] column to the left of the item number. The response is also highlighted in an orange color. This is to allow you to evaluate more quickly the number of students responding incorrectly so you can calculate the number responding correctly, the **difficulty index**. For Item 1 (not Student 1), there are 4 Xs, indicating that 4 people responded incorrectly. Thus, 12 of 16 students responded correctly so the difficulty index for Item 1 is $12/16 = 0.75$ or 75%. (see Column B, Row 22).
- After all data are entered, calculate and record the difficulty index for each of the 8 items.
- Also enter each student's test grade, percent correct, as calculated by the teacher (see upper right first page of each student's test), and enter this in Column S.
- Next, conduct a **distractor analysis**. Rows 24-27 of the spreadsheet are labeled A, B, C, D. These correspond to the answer options for each of the items. Simply count the number of times that the response letter appears in the column and record it by the response option letter.
 - For example, for Item 1, Column C shows A = 3, B = 12, C = 0, and D = 1. These are recorded in rows 23-26 for column C.

- Once all data, including Total Grades, are entered, sort students and their responses by Total Grade then use the top 6 and bottom 6 students to calculate the **discrimination index**. Since there are 16 students the top 1/3 would be the first 5.28 students, so this number was rounded up to 6 students, and this process was also applied to the bottom 1/3 of students. If there are ties on test scores, add the extra students as need to form the two comparison groups. For example, in the top 1/3 there may be 7 students, not 6, with the same total test score. Include all 7 rather than arbitrarily drop one to make the group size 6.
- Finally, answer the questions at the bottom of the Excel spreadsheet page.