Item Analysis

Item analysis provides statistics on overall test performance and individual test questions. This data helps you recognize questions that might be poor discriminators of student performance. You can use this information to improve questions for future test administrations or to adjust credit on current attempts.

For best results, run item analyses on single-attempt tests after all attempts have been submitted and all manually graded questions are scored. Interpret the item analysis data carefully and with the awareness that the statistics are influenced by the number of test attempts, the type of students taking the test, and chance errors.

Item analysis can help you improve questions for future test administrations or fix misleading or ambiguous questions in a current test. Some examples are:

- You investigate a multiple choice question that was flagged for your review on the item analysis page. More Top 25% students choose answer B, even though A was the correct answer. You realize that the correct answer was mis-keyed during question creation. You edit the test question and it is automatically re-graded.
- In a multiple choice question, you find that nearly equal numbers of students chose A, B, and C. Examine the answer choices to determine if they were too ambiguous, if the question was too difficult, or if the material was not covered.
- A question is recommended for review because it falls into the hard difficulty category. You examine the question and determine that it is a hard question, but you keep it in the test because it is necessary to adequately test your course objectives.

Item analysis may be accessed in three locations within the assessment workflow. It is available in the contextual menu for a:

- Test deployed in a content area.
- Deployed test listed on the Tests page.
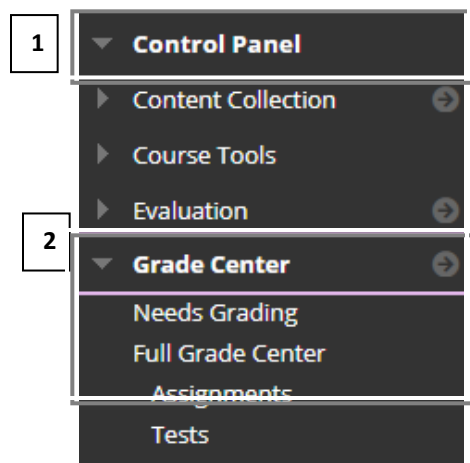- Grade Center column.

[Click here for a video tutorial explaining how Item Analysis works.](#)
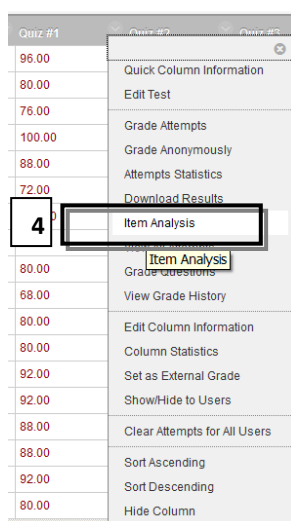
Run an Item Analysis

You can run item analyses on tests that include single or multiple attempts, question sets, random blocks, auto-graded question types, and questions that need manual grading. For tests with manually graded questions that have not yet been assigned scores, statistics are generated only for the scored questions.

Item analysis can be accessed from one of 3 locations within Blackboard:
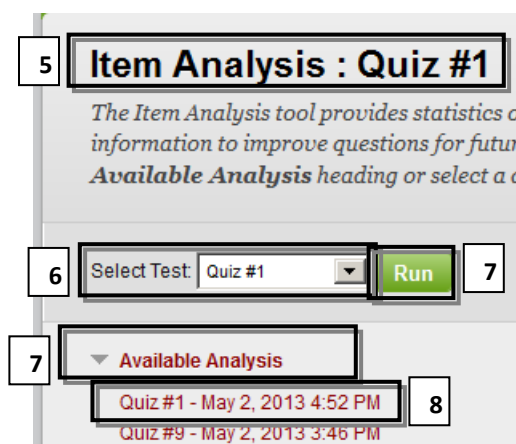
- *A test deployed in a content area.*
- *A deployed test listed on the Tests page.*
- *Grade Center column for a test.*

1. On the **Control Panel**, click **Grade Center.**
2. Click **Full Grade Center.**

3. When the Grade center opens, access the test's contextual menu by clicking the **Action Button** at the top of the column.
4. Click **Item Analysis**

5. The **Item Analysis Page** opens
6. Select the test from the **drop-down menu** and click **Run** [Run]
7. The analysis will run briefly. When complete, a link to the test will appear under the **Available Analysis** heading
8. Click the **quiz link,** and the **Item Analysis Page** opens

UNIVERSITY OF THE
INCARNATE WORD
INSTRUCTIONAL TECHNOLOGY

The Item Analysis Page

Quiz #1

Analysis Last Run May 3, 2013 12:34 PM. Run Item Analysis again to display the latest question data

Edit Test

Test Summary

100.0	25	1	26	85.24	20 hr 23 min
Possible Points	Possible Questions	In Progress Attempts	Completed Attempts	Average Score	Average Time

Discrimination

11 Good Questions
10 Fair Questions
2 Poor Questions
2 Cannot Calculate

Difficulty

19 Easy Questions
6 Medium Questions
0 Hard Questions

Filter Questions

Select Question Type: [All Question Types]   Select Discrimination: [All Discrimination]   Select Difficulty: [All Difficulty]   Go   Reset Filter

Question	Question Type	Discrimination △	Difficulty	Graded Attempts	Average Score	Std Dev	Std Error
The term "PC" refers to computers that ____.	Multiple Choice	0.17	84.62%	26	3.39	1.48	0.29
Flash memory is similar to ROM except that it can be written to more than once.	True/False	0.18	92.31%	26	3.7	1.09	0.22
A PC is available as all of the following EXCEPT ____.	Multiple Choice	0.18	92.31%	26	3.7	1.09	0.22
Email uses store-and-forward technology.	True/False	0.22	96.16%	26	3.85	0.79	0.16
The first hard drive on your computer is usually drive C.	True/False	0.22	96.16%	26	3.85	0.79	0.16
The ____ is a worldwide collection of computer networks that allows people to...	Multiple Choice	0.22	84.62%	26	3.39	1.48	0.29

Displaying 1 to 25 of 25 items   Show All   Edit Paging...

Legend

● Review recommended   ▲ Questions might have changed after deployment   ★ Not all submissions have been graded   (QS) Question Set   (RB) Random Block

There are 4 parts to the Item Analysis page

1. Test Summary
2. Filter
3. Question Statistics Table
4. Legend

The Test Summary

Quiz #1
Analysis Last Run May 2, 2013 4:52 PM. Run Item Analysis again to display the latest question data

Test Summary						Discrimination	Difficulty
100.0	25	1	26	85.24	20 hr 23 min	11 Good Questions	19 Easy Questions
Possible Points	Possible Questions	In Progress Attempts	Completed Attempts	Average Score	Average Time	10 Fair Questions	6 Medium Questions
						2 Poor Questions	0 Hard Questions
						2 Cannot Calculate	

The **Test Summary** is located at the top of the **Item Analysis Page** and provides data on the test as a whole. Only graded attempts are used in item analysis calculations. If there are attempts in progress, those attempts are ignored until they are submitted and you run the item analysis report again.

The Test Summary provides statistics on the test, including:

1. **Possible Points:** The total number of points for the test.
2. **Possible Questions:** The total number of questions in the test.
3. **In Progress Attempts:** The numbers of students currently taking the test that have not yet submitted it.
4. **Completed Attempts:** The number of submitted tests.
5. **Average Score:** Scores denoted with an * indicate that some attempts are not graded and that the average score might change after all attempts are graded. The score displayed here is the average score reported for the test in the Grade Center.
6. **Average Time:** The average completion time for all submitted attempts.
7. **Discrimination:** This area shows the number of questions that fall into the Good, Fair Poor and Cannot Calculate.
8. **Difficulty:** This area shows the number of questions that fall into the Easy Medium and Hard categories.

Discrimination
Indicates how well a question differentiates between students who know the subject matter those who do not. A question is a good discriminator when students who answer the question correctly also do well on the test. Whereas a question is a poor discriminator when students answer the question incorrectly, but still score well on the test.

Discriminator values are noted on the **Question Statistics Table.** Values can range from -1.0 to +1.0. Questions are flagged for review if their discrimination value is less than 0.1 or is negative. Discrimination values cannot be calculated when the question's difficulty score is 100% or when all students receive the same score on a question. Questions are divided into 4 categories; Good, Fair, Poor and Cannot Calculate:

- Good (greater than 0.3) these questions better at differentiating between students with higher and lower levels of knowledge.

UNIVERSITY OF THE
INCARNATE WORD®
INSTRUCTIONAL TECHNOLOGY

- Fair (between 0.1 and 0.3) better at differentiating between students with higher and lower levels of knowledge.
- Poor (less than 0.1) these questions are recommended for review.
- Cannot Calculate: The question's difficulty is 100% or when all students receive the same score on a question.

Discrimination values are calculated with the Pearson correlation coefficient. X represents the scores of each student on a question and Y represents the scores of each student on the assessment.

$$r = \frac{1}{n-1} \sum_{i=1}^{n} \left(\frac{X_i - \bar{X}}{s_X} \right) \left(\frac{Y_i - \bar{Y}}{s_Y} \right)$$

Difficulty

Difficulty is defined as the percentage of students who answered the question correctly. Questions are segregated into three categories; Easy (greater than 80%), Medium (between 30% and 80%) and Hard (less than 30%) categories. Questions in the Easy or Hard categories are recommended for review and are indicated with a red circle. Difficulty: The percentage of students who answered the question correctly.

Difficulty levels are noted on the **Question Statistics Table.** Difficulty levels that are slightly higher than midway between chance and perfect scores *do a better job differentiating students who know the tested material from those who do not.* It is important to note that high difficulty values do not assure high levels of discrimination.

Question Statistics Table

The **Question Statistics Table** provides item analysis statistics for each question in the test. Questions that are recommended for your review are indicated with red circles so that you can quickly scan for questions that might need revision.

In general, good questions (that do not have to be reviewed) have:

- Medium (30% to 80%) difficulty.
- Good or Fair (greater than 0.1) discrimination values.

Questions that are recommended for review are indicated with red circles. They may be of low quality or scored incorrectly. In general, questions recommended for review have:

- Easy (> 80%) or Hard (< 30%) difficulty.
- Poor (< 0.1) discrimination values.

Review Flagged Questions

You can investigate a question that is flagged for your review by accessing its Question Details page. This page displays student performance on the individual test question you selected.

1. On the Item Analysis page, scroll down to the question statistics table.
2. Select a linked question title to display the **Question Details page.**

Filter Questions

Question	Question Type	Discrimination △	Difficulty	Graded Attempts	Average Score	Std Dev	Std Error
An email address contains a user name and an email server name connected by t...	True/False	Cannot Calculate	100.0%	26	4.0	0.0	0.0
The ____ is mounted on the motherboard and is responsible for executing instr...	Multiple Choice	Cannot Calculate	100.0%	26	4.0	0.0	0.0
If you click the Maximize button on a window, it becomes the ____ button.	Multiple Choice	-0.09	53.85%	26	2.16	2.04	0.4
In Windows, right-clicking an object ____.	Multiple Choice	0.02	84.62%	26	3.39	1.48	0.29
____ lets you display multiple Web pages in the same browser window.	Multiple Choice	0.11	92.31%	26	3.7	1.09	0.22
____ is a storage medium.	Multiple Choice	0.13	96.16%	26	3.85	0.79	0.16
A collection of Web pages is called a Web site.	True/False	0.17	76.93%	26	3.08	1.72	0.34
The term "PC" refers to computers that ____.	Multiple Choice	0.17	84.62%	26	3.39	1.48	0.29

Quiz #1

A	B	C	D	E	F	G
-0.09	53.85%	26	2.16	2.04	0.4	0
Discrimination Poor	Difficulty Medium	Graded Attempts	Average Score	Std Dev	Std Error	Skipped

3. The **Question Details page** details the question statistics, question type, answers, and detail on chosen answers. question type,and are all noted
4. The summary table displays statistics for the question, including:
   a. Discrimination: Indicates how well a question differentiates between students who know the subject matter those who do not.
   b. Difficulty: The percentage of students who answered the question correctly
   c. Graded Attempts: Number of question attempts where grading is complete. Higher numbers of graded attempt produce more reliable calculated statistics.
   d. Average Score: Scores denoted with an * indicate that some attempts are not graded and that the average score might change after all attempts are graded. The score displayed here is the average score reported for the test in the Grade Center.
   e. Std Dev: Measure of how far the scores deviate from the average score. If the scores are tightly grouped, with most of the values being close to the average, the standard deviation is small. If the data set is widely dispersed, with values far from the average, the standard deviation is larger.
   f. Std Error: An estimate of the amount of variability in a student's score due to chance. The smaller the standard error of measurement, the more accurate the measurement provided by the test question.
   g. Skipped: Number of students who skipped this question.

Question:

• If you click the Maximize button on a window, it becomes the _____ button.

		Answers	Total ⓘ	Top 25% ⓘ	2nd 25% ⓘ	3rd 25% ⓘ	Bottom 25% ⓘ
✅	a.	Restore down	14(53.85%)	3	2	6	3
	b.	Minimize	7(26.93%)	1	4	2	0
	c.	Close	0(0.0%)	0	0	0	0
	d.	none of the above; it remains the Maximize button	5(19.24%)	1	2	0	2

5. The question text and answer choices are displayed. The information varies depending on the question type

Type of Information Provided	Question Types
Number of students who selected each answer choice -AND-distribution of those answers among the class quartiles.	• Multiple Choice • Multiple Answer • True/False • Either/Or • Opinion Scale/Likert
Number of students who selected each answer choice.	• Matching • Ordering • Fill in Multiple Blanks
Number of students who got the question correct, incorrect, or skipped it.	• Calculated Formula • Calculated Numeric • Fill in the Blank • Hot Spot • Quiz Bowl
Question text only.	• Essay • File Response • Short Answer • Jumbled Sentence (also includes the answers students choose from)

6. The distribution of answers among the class quartiles is included for Multiple Choice, Multiple Answer, True/False, Either/Or, and Opinion Scale/Likert question types. The distribution shows you the types of students who selected the correct or incorrect answers.

   • Top 25%: Number of students with total test scores in the top quarter of the class who selected the answer option.
   • 2nd 25%: Number of students with total test scores in the second quarter of the class who selected the answer option.
   • 3rd 25%: Number of students with total test scores in the third quarter of the class who selected the answer option.

- Bottom 25%: Number of students with total test scores in the bottom quarter of the class who selected the answer option.

Symbol Legend
Symbols appear next to the questions to alert you to possible issues:

- Review recommended: This condition is triggered when discrimination values are less than 0.1 or when difficulty values are either greater than 80% (question was too easy) or less than 30% (question was too hard). Review the question to determine if it needs revision.
- Question may have changed after deployment: Indicates that a part of the question changed since the test was deployed. Changing any part of a question after the test has been deployed could mean that the data for that question might not be reliable. Attempts submitted after the question was changed may have benefited from the change. This indicator helps you interpret the data with this in mind. This indicator is not displayed for restored courses.
- Not all attempts have been graded: Appears for a test containing questions that require manual grading, such as essay questions. In a test containing an essay question with 50 student attempts, this indicator shows until the instructor grades all 50 attempts. The item analysis tool uses only attempts that have been graded at the time you run the report.
- (QS) and (RB): Indicate that a question came from a question set or random block. Due to random question delivery, it is possible that some questions get more attempts than others.

Item Analysis and Multiple Attempts, Question Overrides, and Question Edits
The item analysis tool handles multiple attempts, overrides, and other common scenarios in the following ways:

- When students are allowed to take a test multiple times, the last submitted attempt is used as the input for item analysis.
- Grade Center overrides do not impact the item analysis data because the item analysis tool generates statistical data for questions based on completed student attempts.
- Manually graded questions or changes made to the question text, correct answer choice, partial credit, or points do not update automatically in the item analysis report. Run the analysis again to see if the changes affected the item analysis data. (BbBethS, 2013)

Edit or Delete a Test Question
In your Item analysis, you have discovered that one of the test questions has the incorrect answer keyed and you want to update and re-grade the test.
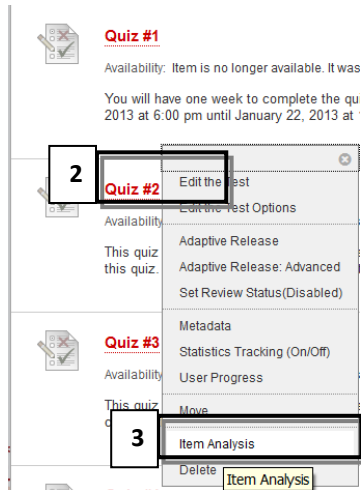
1. On the **Course Menu,** click the link to your assessment
2. Click the **Action Button** ⌄, next to the assessment link that you want to edit
3. Click **Item Analysis**
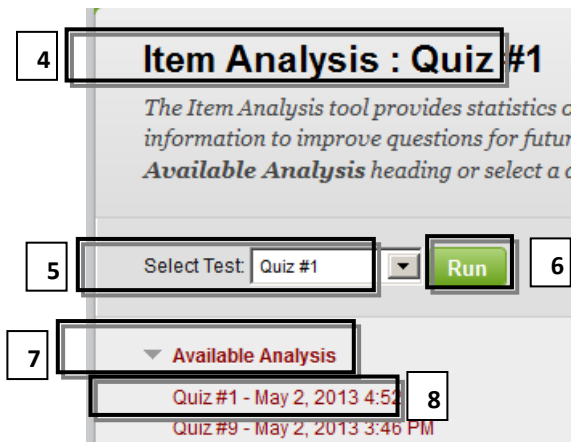
4. The **Item Analysis Page** opens
5. Select the test from the **drop-down menu**
6. Click **Run** `Run`
7. The analysis will run briefly. When complete, a link to the test will appear under the **Available Analysis** heading
8. Click the **quiz link,** and the **Item Analysis Page** opens

9. Locate the **edit test** `Edit Test` button at the top right of the page and click it

10. The Test Canvas opens. Locate the question that you want to edit and clickthe **Action Button** ⌄, choose **Edit** or **Delete and Regrade**
11. Make the necessary change to the answer
12. Click **Submit And Update Attempts**. `Submit and Update Attempts`
13. The test will be regraded, and the revised scores will update in the Grade Center

References

BbBethS. (2013, April 04). *Running Item Analysis on a Test*. Retrieved from Blackboard Help: https://help.blackboard.com/en-us/Learn/9.1_SP_10_and_SP_11/Instructor/070_Tests_Surveys_Pools/112_Running_Item_Analysis_on_a_Test