Using Excel's Pivot Table Function to Examine Electronic Exam Results

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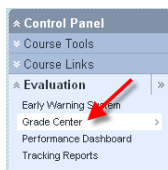
Introduction

The introduction of electronic testing methods into higher education has helped instructors to speed up creation of exams, grade exams, reduce the opportunity for students to cheat, and now to receive more information regarding performance on each question. Traditionally professors key in on factors such as the overall exam average or percentage scoring on each question. When looking at the overall exam average there is a chance professors are missing information regarding details on individual questions that may help them become better test writers. Even when individual question statistics are available, those numbers may not tell the entire story regarding the question's effectiveness.

This paper introduces a method to examine electronic exam results using Excel's Pivot Table function. This methodology applies to any course where multiple choice tests are given, especially if the exams are given and answers are collected in an electronic format. Performing an electronic analysis of exam results allows professors to cross tabulate each question's effectiveness with the performance of students and to identify questions where students have performed poorly. Questions where students have performed poorly may fall into one of several categories: 1) incorrectly keyed answers, 2) confusing text, 3) content that was not covered during class, or 4) higher level questions. Using Excel's Pivot Table function allows professors identify and categorize these questions before presenting the test results in class. Knowing about bad questions before an exam is reviewed in class can save classroom time and effort.

In this paper I will use Exam results from Blackboard 9.0, a popular electronic course delivery module. The results of the exam will be downloaded into an Excel spreadsheet and then analyzed using the Pivot Table function. The results will be simultaneously analyzed by student performance and question performance.

To analyze results using the Excel we must first download and save our results in an Excel manner. In this example, a multiple choice exam was previously administered in Blackboard. The results will need to be downloaded from the grade center. From within Blackboard, open the grade center.
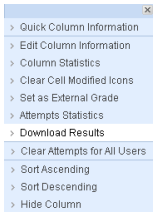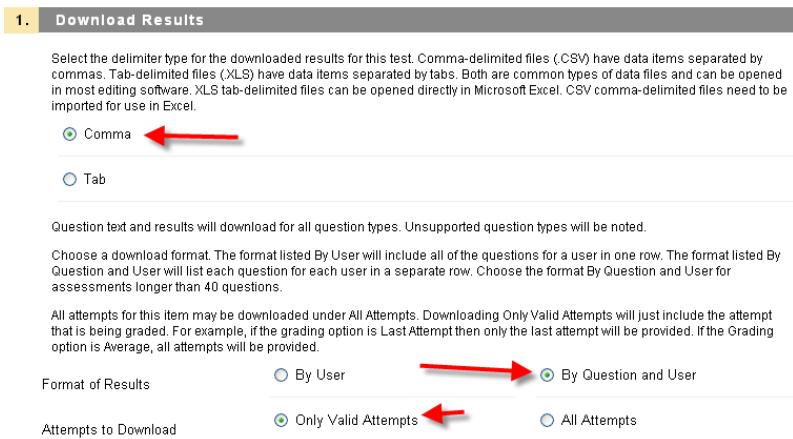

Then find the exam you wish to analyze.

At the top right of the column you wish to analyze, click the dropdown box, then select Download Results.

From the Download Results page, select the "Comma" delimited format for Excel. Then make sure you select the Format of Results "By Question and User" and download "Only Valid Attempts"


You will then be asked to save the file. Click on the Save button.
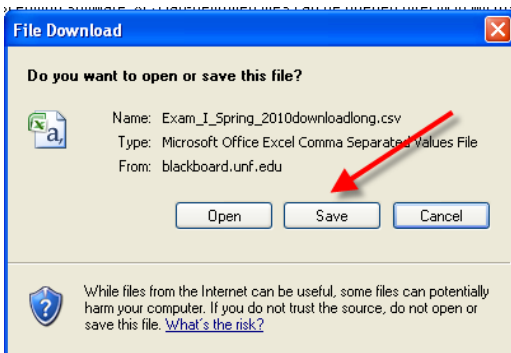
Save the *.csv file somewhere you will remember for instance in the My Documents folder. Once you have the file saved, open Microsoft Excel and select the Open option from the ribbon.

Find the folder where you saved your file. Microsoft Excel defaults to only looking for Excel files so when you find the folder, you need to change the type of file Excel is looking for. Change the "Files of Type" option to "All Files (*.*)" as seen below in the picture.
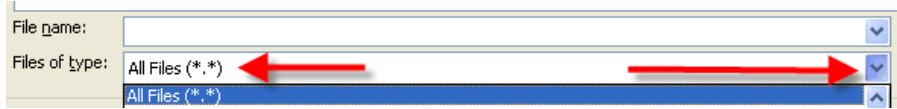

Select your file in the folder and click Open. My file was named Exam_I_Spring_2010downloading.csv.
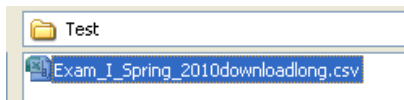
The file is in a comma delimited format. We will need to tell Excel a bit about our file before we can work with the data. Select the data type "Delimited" in the Text Import Wizard box then select Next.
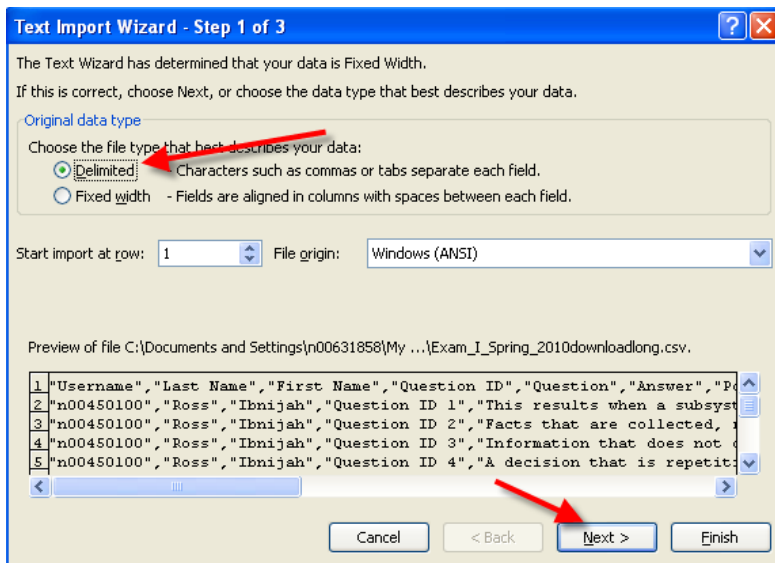
Then add "Comma" as one of the Delimiters in step 2 of the Text Import Wizard and then click Next.
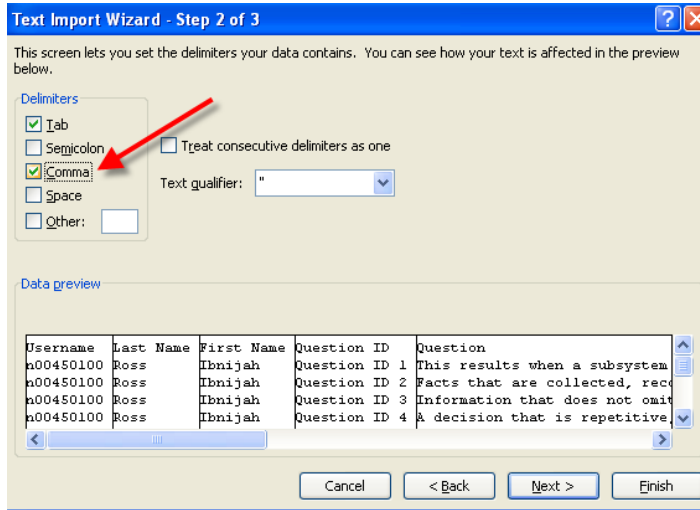
For step three of the Text Import Wizard just click "Finish".
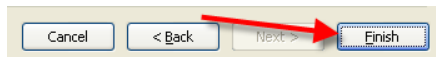
Our data should now appear in Excel. Examine the data, we have columns with Last Name, Question ID, Question Text, Answer Text, the possible points and the autoscore the user received.


We want to put this data in a Pivot Table. Click on the Insert Tab from the menus at the top of the screen. Next click on the PivotTable option as seen below.
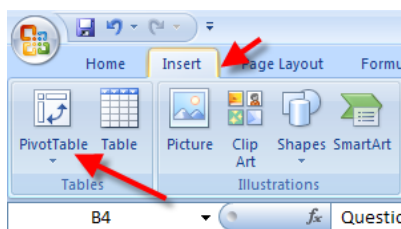

Go ahead and accept the default table or range. (Your cursor should have been inside the data in the table).
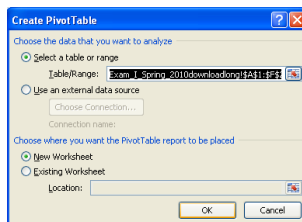
We need to enter the data into the PivotTable that we would like to see. For this example we need the Question ID, Last Name, and Auto Score. Click and drag the Last Name field from the top box to the Row Labels box below. Then click the Question ID field to the Column Labels box. Last click the Auto Score field and drag it to the Values box.
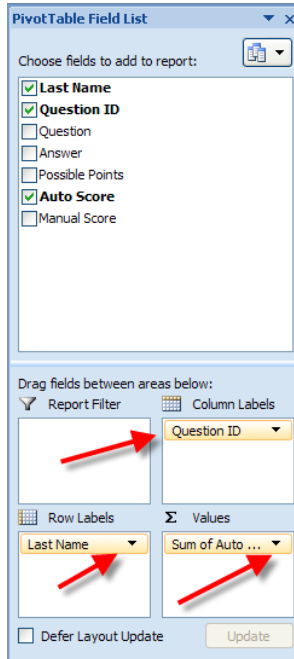
We want to sort our exam results so our students grades are filtered with the high scores on top and the low scores on the bottom. In the far right column, select one of the data points in the Grand Total column, then right click and select the Sort option. Select the sub option to sort the data Largest to Smallest.
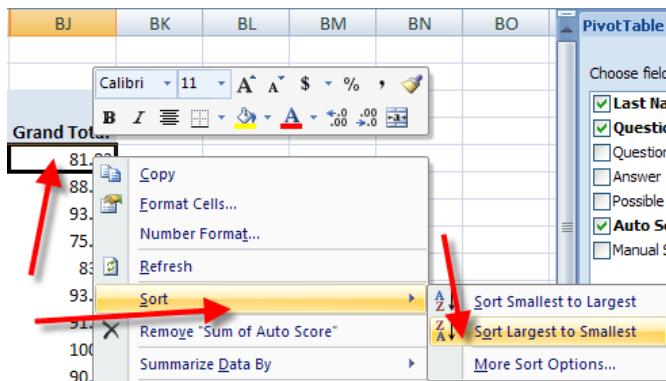
We would also like to see the exam results sorted by question performance in a right to left order. This allows us to see the questions where students performed poorly at the bottom left of our table. Find the last row of the table and click somewhere in the Grand Total row. Right click on any cell in this row, then select the Sort option with the Sort Smallest to Largest option. This will show the results of each question with the questions where fewer students responded correctly to the far left of our table.
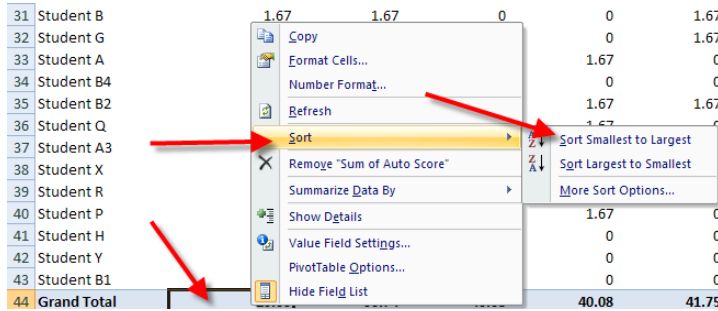
As you can see by the example below the students results are sorted by overall performance top to bottom. (For this example I changed the point values to 1 instead of 1.67) So the students with the highest possible scores out of a perfect 60 appear top to bottom and the questions with the lowest overall performance appear left to right. As we can see in the example below questions 45 and questions 16 were two questions where it appears students performed poorly as only 5 and 7 students answered these questions correctly. Further examination of the data in the table shows that even though only five students answered question 45 correctly, all five of the students were "A" students. This question was a valid question to determine students with a better understanding of tougher material. Question 16 also appears to be a valid question as most of the top students who scored 50 or above out of 60 also answered this question correctly.

Summary

Using the Excel PivotTable function allows us to examine question performance by student and to determine if questions might have been poor questions or good questions with discriminate validity on more difficult learning concepts.