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.

Exam Spring 2 🖾	Excel_Group 🗵
71.81 📌	57.5 🗖
60.12	46.5
93.52	51 💻
83.50	60
85.17	68.5
90.18	60
81.83	35.5
75.15	49.5
83.50	54.5
93.52	68.6
	~
	>

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

×
> Quick Column Information
> Edit Column Information
> Column Statistics
> Clear Cell Modified Icons
> Set as External Grade
> Attempts Statistics
> Download Results
> Clear Attempts for All Users
> Sort Ascending
> Sort Descending
> Hide Column

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"

Download Results		
Select the delimiter type for the commas. Tab-delimited files (. in most editing software. XLS t imported for use in Excel.	downloaded results for this test. Comma-delin XLS) have data items separated by tabs. Both a ab-delimited files can be opened directly in Micr	nited files (.CSV) have data items separated by re common types of data files and can be opener osoft Excel. CSV comma-delimited files need to b
💿 Comma 🔫	_	
🔿 Tab		
Question text and results will d	ownload for all question types. Unsupported qu	estion types will be noted.
Choose a download format. Th Question and User will list eac assessments longer than 40 c	ne format listed By User will include all of the qui h question for each user in a separate row. Cho questions.	estions for a user in one row. The format listed B loose the format By Question and User for
All attempts for this item may b that is being graded. For exam option is Average, all attempts	e downloaded under All Attempts. Downloading ple, if the grading option is Last Attempt then on will be provided.	I Only Valid Attempts will just include the attempt ly the last attempt will be provided. If the Grading
Format of Results	O By User	ightarrow By Question and User
Attempts to Download	💿 Only Valid Attempts 🗲	 All Attempts

You will then be asked to save the file. Click on the Save button.

File Download 🛛 💦	
Do you want to open or save this file?	
Name: Exam_I_Spring_2010downloadlong.csv Type: Microsoft Office Excel Comma Separate Values File From: blackboard.unf.edu Open Save Cancel	
While files from the Internet can be useful, some files can potentially harm your computer. If you do not trust the source, do not open or save this file. <u>What's the risk?</u>	

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.

			_
File <u>n</u> ame:		~	
Files of <u>type</u> :	All Files (*.*)	~	
	All Files (*,*)	^	

Select your file in the folder and click Open. My file was named Exam_I_Spring_2010downloading.csv.

🛅 Test
Exam_I_Spring_2010downloadlong.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.

Text Import Wizard - Step 1 of 3	X
The Text Wizard has determined that your data is Fixed Width.	
If this is correct, choose Next, or choose the data type that best describes your data.	
Original data type	
Choose the file type that best describes your data:	
Delimited Characters such as commas or tabs separate each field.	
C Fixed width - Fields are alighed in coldnins with spaces between each field.	
Start import at row: 1 🗢 File origin: Windows (ANSI)	~
$\label{eq:preview} Preview of file C(\Documents and Settings\n00631858\My \ldots\Exam_I_Spring_2010 downloadlong.csv.$	
1 "Username", "Last Name", "First Name", "Question ID", "Question", "Answer", "Pe	~
2 "n00450100", "Ross", "Ibnijah", "Question ID 1", "This results when a subsyst	
3"n00450100", "Ross", "Innijan", "Question ID 2", "Facts that are collected, 1 4 "n00450100", "Ross", "Ibnijah", "Question ID 3", "Information that does not of	
5 "n00450100", "Ross", "Ibnijah", "Question ID 4", "A decision that is repetit:	~
	_
Cancel Cancel Sack <u>Next ></u>	

Then add "Comma" as one of the Delimiters in step 2 of the Text Import Wizard and then click

Text Import Wizard - Step 2 of 3	?	×
This screen lets you set the delimiters your dat below.	ta contains. You can see how your text is affected in the preview	
Delimiters Jab Semicolon Treat consecutive Text gualifier: " Data greview	e delimiters as one	
Jsername Last Name First Name n00450100 Ross Ibnijah n00450100 Ross Ibnijah n00450100 Ross Ibnijah n00450100 Ross Ibnijah	Question ID Question Question ID 1 This results when a subsystem Question ID 2 Facts that are collected, reco Question ID 3 Information that does not omit Question ID 4 A decision that is repetitive	
	Cancel < <u>B</u> ack <u>N</u> ext > <u>F</u> inish	

For step three of the Text Import Wizard just click "Finish".

	-	
Cancel	< <u>B</u> ack	Next > Einish

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.

	А	В	С	D	E	F
1	Last Name	Question ID	Question	Answer	Possible Points	Auto Score
2	Student A	Question ID 1	This results wh	Goal congruenc	1.67	1.67
3	Student A	Question ID 10	Businesses usu	turnaround doc	1.67	1.67
4	Student A	Question ID 11	The general lec	control account	1.67	1.67
5	Student A	Ouaction ID 12	Dro numbered	coquence code	1.67	1 67

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).

Create	PivotTable	? 🛛
Choose t	he data that yo	u want to analyze
⊙ <u>S</u> ele	ect a table or ra	nge
	Table/Range:	Exam_I_Spring_2010downloadlong!\$A\$1:\$F\$2 📧
O <u>U</u> se	an external da	ta source
	Choose Conn	ection
	Connection nar	ne:
Choose v	where you want	the PivotTable report to be placed
⊙ Nev	v Worksheet	
<u>○ E</u> xis	ting Worksheet	
	Location:	15
		OK Cancel

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.

PivotTable Field List	▼ ×
Choose fields to add to	report:
Last Name	
Question ID	
Question	
Answer	
Manual Score	
El noridor Score	
Drag fields between an	eas below:
Report Filter	Column Labels
	Question ID 🔻
	Question is
Row Labels	Σ Values
Last Name 🔻	Sum of Auto 🔻
📃 Defer Layout Upda	te Update

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.

31	Student B	1.6	57 1.67	0		0	1.67
32	Student G		⊆ору	- 1		0	1.67
33	Student A	P	<u>F</u> ormat Cells	- 1		1.67	0
34	Student B4		Number Format	- 1		0	0
35	Student B2		Refresh			1.67	1.67
36	Student Q	-				1 67	2
37	Student A3		<u>2</u> 01	•	z∔	<u>Sort Smallest to Large</u>	st ,
38	Student X	X	Remove "Sum of Auto Score"		Z A↓	Sort Largest to Smalle	st ,
39	Student R		Summarize <u>D</u> ata By			More Sort Options	1
40	Student P	0 <u>3</u>	Show D <u>e</u> tails			1.67	0
41	Student H	0,	Value Field Settings			0	0
42	Student Y		BivetTable Options	- 1		0	0
43	Student B1		Protrable Options	- 1		0	0
44	Grand Total		Hide Field List			40.08	41.75

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.

3	Sum of Auto Score	e Column Labels 💌		
4	Row Labels 🛛 🖓	Question ID 45	Question ID 16	Grand Total
5	Student A7	1	1	60
6	Student N	1	0	59
7	Student V	1	1	58
8	Student M	1	1	57
9	Student A9	1	1	57
10	Student A8	0	1	54
11	Student I	0	1	52
12	Student B3	0	1	50
13	Student A4	0	0	50
14	Student B4	0	0	49
15	Student B2	0	0	47
16	Student A3	0	0	45
17	Student H	0	0	36
18	Student B1	0	0	26
19	Grand Total	5	7	700

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.