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Measuring Evaluation Results with Microsoft Excel

The purpose of this tutorial is to provide instruction on performing basic functions using Microsoft Excel. Although Excel has the ability to perform a large array of mathematical and statistical functions, this resource addresses data entry, and calculating means (averages) for either one time or pre/post survey instruments (or post/pre instruments). In addition, when an instrument is completed at two points in time, Excel provides the ability to perform statistical tests (t-tests) to determine the significance of mean differences between the pre and post test for participants receiving a program (or treatment). Finally, additional resources to help you master Excel are listed at the end of this brief.

1. Open Microsoft Excel.

You will be put into a blank "workbook" which is simply a blank spreadsheet. Please note that Excel automatically numbers the rows in the left hand margin, and assigns letters to the columns – these will not change and you must label both your rows and columns for your data entry and analysis. (Excel uses these column letters and numbered rows to perform mathematical functions, which is explained later.)

2. Label your columns.

Start with the top row and label each column, as follows:

a. Column A = Participant Number or identifying word, symbol, etc. [For example, if you have 12 participants, number from 1-12 DOWN the column] See Figure 1, right.

Figure 1. Column labels.

	A
1	Participant Number
2	1
3	2
4	3
5	4
6	5
7	6
8	7
9	8
10	9
11	10
12	11
13	12

b. The Column labels across the spreadsheet (B, C, D, etc.) need to be labeled for each item on your survey that has a response that needs to be coded. [In this example, there are five items (questions) to measure, so Column B gets labeled Question 1, Column C is labeled item 2, etc.]

	A	B	C	D	E	F
1	Participant Number	Question 1	Question 2	Question 3	Question 4	Question 5

c. Note also that it is helpful to include a key word from each question to help you remember which question is which. For example, if your statement reads, "I am confident in choosing books that are appropriate for my children," then you may want to label that column, "Question 1 Confidence" so you can understand your spreadsheet more fully.

	A	B	C	D	E	F
1	Participant Number	Question 1 – Confidence	Question 2 - Insert key word	Question 3 Insert key word	Question 4 Insert key word	Question 5 Insert key word

3. **The Spreadsheet.** Once your columns are all labeled and the participant numbers delineate each row of responses, your spreadsheet should look like this:

	A	B	C	D	E	F
1	Participant Number	Question 1	Question 2	Question 3	Question 4	Question 5
2	1					
3	2					
4	3					
5	4					
6	5					
7	6					
8	7					
9	8					
10	9					
11	10					
12	11					
13	12					
14	Mean Score					

4. Now you are ready to **prepare your data** for entry into a spreadsheet.

5. **Entering the data and assigning values to your responses.** The first important step to complete when entering data is assigning numerical value to each response on your Likert scale from your evaluation instrument. (A **Likert scale** is used to rate each item on a response scale. For instance, when parents complete pre and/or post tests about a workshop, they are asked to answer each question by rating each item on a 1-to-5 response scale.)
    a. For example, if your Likert scale includes the items: "strongly agree," "agree," "neutral," "disagree," and "strongly disagree" – you could code responses to have strongly agree = 5, agree = 4, neutral = 3, disagree =2 and strongly disagree = 1 so that a higher score reflects a higher level of agreement of each item.

    b. This is important because after you enter the individual scores, you will <u>calculate an average – or mean score</u> for the whole group for each survey question. In the case of assigning higher values to stronger agreement, then higher mean scores for each question will translate into levels of agreement for each item, and thus, lower scores will reflect participants' disagreement with each item asked.

    c. <u>It is extremely important to note that how you interpret the level of agreement for each survey question will depend on each item asked.</u> For example, if your survey states, "I am confident in choosing books that are appropriate for my children," then you would hope for a higher mean – closer to 4 or 5 which indicates that respondents do feel confident. However, if you had phrased the question differently, "I am NOT confident in choosing books that are appropriate for my children," then you would like to see a lower mean score, closer to 2 or 1 which would reflect parental confidence.

6. After assigning a value to each response, you can **enter the data accordingly into the spreadsheet.** *(Strongly agree = 5, agree = 4, neutral = 3, disagree =2 and strongly disagree = 1 so that a higher score reflects a higher level of agreement of each item).*

   a. For example, if Participant #1 responds to question #1 with an "agree" response, you would enter a 4 in that cell. It would look like this:

	A	B
1	Participant Number	Question 1
2	1	4
3		

   b. You can continue to enter the corresponding number for each response in each cell of the spreadsheet. If your data was as follows:
      i. Participant 1, Question 1, "agree" = 4
      ii. Participant 1, Question 2, "disagree" = 2
      iii. Participant 1, Question 3, "neutral" = 3
      iv. Participant 2, Question 1, "strongly agree" = 5
      v. Participant 2, Question 2, "agree" = 4
      vi. Participant 2, Question 3, "strongly disagree" = 1

   The spreadsheet entry would look like this:

	A	B	C	D
1	Participant Number	Question 1	Question 2	Question 3
2	1	4	2	3
3	2	5	4	1
4				

7. Once you have filled in the spreadsheet you can **calculate the mean score for each question asked.**

8. **Calculating the mean in Excel** for a survey administered ONE TIME is done by the following steps:

   a. Place the cursor in the box where you want the mean score to appear (see below (X) for example).

	A	B	C	D
1	Participant Number	Question 1	Question 2	Question 3
2	1	4	2	3
3	2	5	4	1
4	Mean Score	X		

   b. Go to the ***fx*** symbol[1] and place the cursor inside the blank area to the right of the ***fx*** symbol. Type: **=average(B2:B3)** in the blank area to the right of the symbol. If you look at the table above, you will see that the score in column B row 2 = 4, and in column B row 3 = 5. By calculating an average for column B, you will know the mean for that item on the pre-test. Note that if you have more than two respondents, you will need to include more numbers in your average. For

[1] Depending in the version of Excel you use, the ***fx*** symbol will either be just above column C on your spreadsheet or next to the ∑ symbol on the top toolbar. Some versions use a pop up menu, in which you would select the functional category "statistical" and then "average."

example, if you have 12 respondents, with data in boxes B2 through B13, then you would type **average(B2:B13)**.

c. Once you type in the formula above, depress the enter key and the mean will appear in the box you marked, and should look like this:

	A	B	C	D
1	Participant Number	Question 1	Question 2	Question 3
2	1	4	2	3
3	2	5	4	1
4	Mean	4.5		

As you can see the mean score of question 1 for this sample of two participants is 4.5, which corresponds between "strongly agree" and "agree." You could then report that your mean score on Question 1 *before* your program was 4.5.
If you are conducting a survey that is administered only once, you can compute and report the mean scores for each item on your survey. If you are using a pre and post test, step 9 provides instruction for the remaining data entry and then calculating and testing differences in means for each item at the two points in time.

9. **Calculating the mean in Excel** for a survey administered TWICE is done by repeating steps 1-8 to **generate a spreadsheet and calculate means for your post test instruments** if you have one. In many instances, it is possible to make one spreadsheet that contains both pre and post test scores, which can be arranged as follows:

	A	B	C	D	E	F	G	H
1	Participant Number	Question 1 PRE	Question 2 PRE	Question 3 PRE		Question 1 POST	Question 2 POST	Question 3 POST
2	1	4	2	5		5	4	5
3	2	3	3	3		4	3	4
4	Mean Score	3.5	2.5	4.0		4.5	3.5	4.5

10. After you have calculated both pre and post test means for each item you can **report the changes in scores between the program's beginning and end.**

a. For example, if your mean score on an item, "I am confident in choosing books that are appropriate for my children," on the pre-test was **3.5** (between neutral and "agree" on our scale), and a **4.5** on the post test (between "agree" and "strongly agree" on our scale); you could report that on average, participants in your workshop increased 1.0 on that item, reflecting an increase in parent's confidence (one of your program goals).

11. **The T-Test**. After calculating the means for both pre and post test scores, it is important to test whether or not the differences in mean scores for each item are significant, rather than due to chance or other circumstances. For our purposes, we can run a t-test using Excel to determine the significance of the differences in means between the pre- and post-tests. Note that the t-test tells us whether or not the difference in means for each question is statistically significant among all program participants.

To begin the t-test, place the cursor in the box where you want the t-test result to appear (see below (X) for example.)

	A	B	C	D	E	F	G
1	Participant Number	Question 1 PRE	Question 1 POST	Question 2 PRE	Question 2 POST	Question 3 PRE	Question 3 POST
2	1	4	5	4	4	5	5
3	2	3	4	2	3	3	4
4	Mean Score	3.5	4.5	3	3.5	4.0	4.5
5	T-test, p-value	X					

a. Then place your cursor on the ***fx*** symbol, a pop-up list will appear that provides a list of possible mathematical functions that Excel can perform. Under "select a function" highlight TTEST, and depress your enter key. You will then be asked to specify an array – or more simply the group of numbers you want to test. In this case, array number 1 would correspond to the scores given on Question 1 PRE test, columns B2:B3 on the table above. Therefore, you need to type B2:B3 in the window to the right of "array 1" in the function box. The scores you are comparing with are the POST test scores on that same question, columns C2:C3 above, this is your second array, so you need to type C2:C3 to the right of "array 2" in the function box. You then need to specify if you want a one or two tailed distribution, in this case you need to enter "2" in the window next to the "tails" box. Finally, because we are testing the same sample at two different time intervals, we need to do a paired t-test – and thus, need to enter a "1" next to the "type" window in the function box. *(For more explanation of these statistical functions check Excel's website at* http://office.microsoft.com/en-us/training.aspx *to access free tutorials.)* Note that if you have more than two respondents, you will need to include more numbers in your average. For example, if you have 12 respondents, with data in boxes B2 through B13 for the pre-test, then you would type **B2:B13** for the pre-test array, and **C2:C13** for the post-test array.

b. Once you have entered all the information in the function popup box, depress the enter key and Excel will perform the test and generate a p-value which will appear in the box you marked, and should look like this:

	A	B	C	D	E
1	Participant	Question 1 Pre	Question 1 Post	Question 2 Pre	Question 2 Post
2	1	5	5	5	5
3	2	5	5	3	5
4	3	5	5	5	5
5	4	5	5	4	
6	5	5	5	4	4
7	6	5	5	4	5
8	7	4	5	4	5
9	8	5	5	5	5
10	9	5	5	4	5
11	10	4	5		4
12	11	5	5	5	5
13	12	4	5	4	5
20	Mean Score	4.78	4.97	4.24	4.88
21	Difference	0.19		0.64	
22	p-value	0.0488		0.0014	

c. **Interpreting the p-value**. The p-value is a numerical estimate of the reliability of our assumption that the difference in means on pre and post surveys is real and not due to chance.

i. As you can see the p-value generated by a t-test for Question 1 is .0488, and .0014 for Question 2.

ii. In general, researchers say that a p-value of .10 or less is statistically significant, which means that we are 90% sure that the result we see (the difference in means for each question) is not due to chance.

iii. Therefore, when reporting the results of your pre/post test on evaluation surveys, you could report that a t-test confirms that the change on a given item were "significant at a p<.10 level."

Summary

This brief provides an overview of how Microsoft Excel can enable you to quantify the impact of programs delivered in your community. At a minimum, Excel can compute the mean responses to each item on your evaluation instrument, whether they are administered once or twice during your program. This allows an educator to report the average response among program participants. In addition, when both a pre and post test are completed, Excel can both calculate the change in means among participants and test whether or not the differences in mean scores for each item are significant, rather than due to chance.

There are many additional resources available that provide simple instructions on using Microsoft Excel, many of which are free of charge:

Websites:
Microsoft Office Online Tutorials http://office.microsoft.com/en-us/training.aspx provides many free tutorials.
http://www.exceltip.com/tutorial/index.html provides free tutorials.
http://www.videoprofessor.com sells tutorials for many different versions of Excel, at a nominal charge ($6.95).
http://www.vtc.com/products/excel2000.htm sells more advanced tutorials.

Printed Materials:

- Mastering Excel 2000 (for beginner)
- Microsoft Excel Version 2002 Step by Step
- Excel 2002 For Dummies®
- Microsoft Excel 2002 Simply Visual
- Absolute Beginner's Guide to Microsoft Excel 2002
- Absolute Beginner's Guide to Microsoft Office Excel 2003

(All can be accessed through http://www.amazon.com or http://www.exceltip.com/bc-Microsoft_Excel_books_for_Beginners,3)

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