

# District Data Coordinator Toolbox: Implementing Database Connections in Excel

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# Data, data, everywhere

The volume of and the push to make use educational data is growing:

- More people must become data savvy (teachers, coordinators, etc.)
- Leadership may request cyclical reporting to establish and monitor trends
- Little time to document business rules or standardize data storage practices
- Quality control can take time or be difficult to manage

Teachers, principals, administrators and analysts often have difficulty keeping pace.



## Some familiar scenarios (using data stored in SQL, Oracle, Access, etc.)

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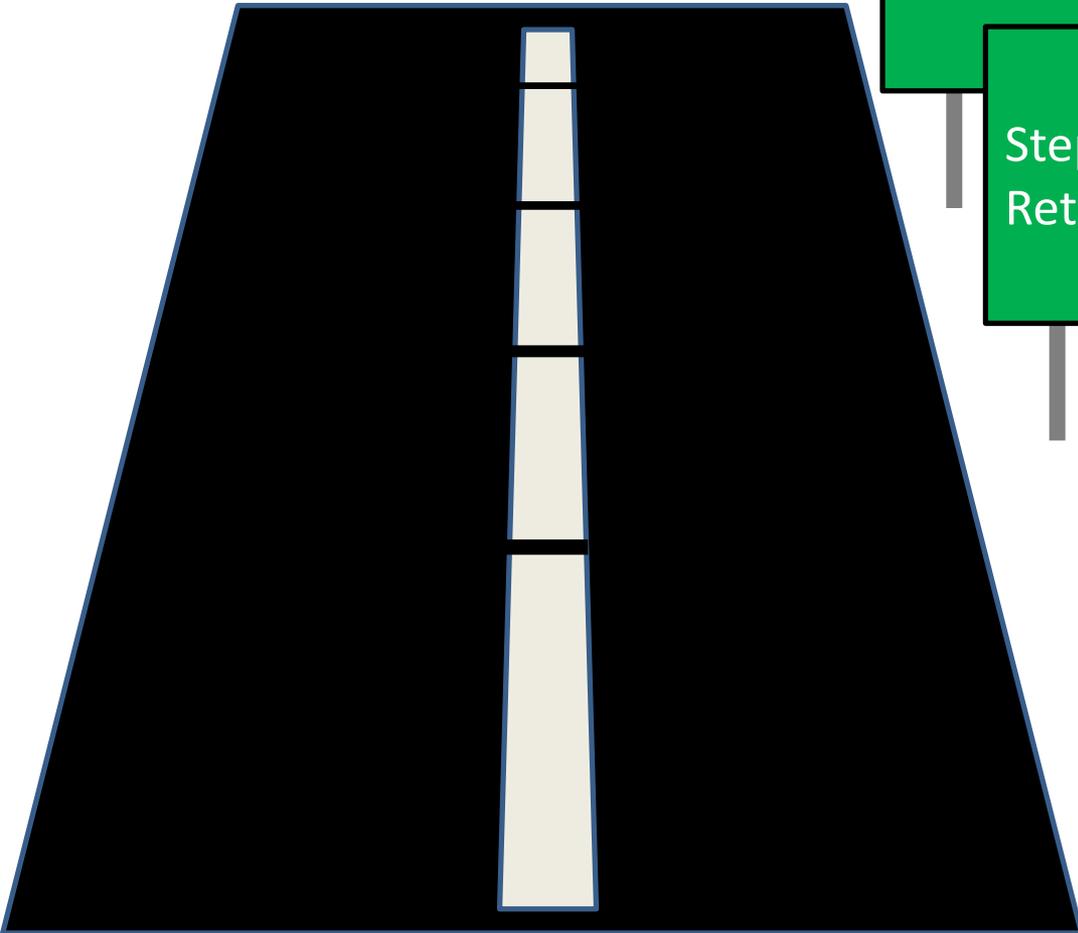
- The same data points are necessary across reporting cycles
- Process to acquire and report data is repetitive across reporting cycles
- A non-technical person may be tasked with reporting responsibility
- Lack of documentation
- Analysts report shortage of storage space on network or external hard drives
- Analysts are maintaining idiosyncratic versions of various data elements (e.g. test score files, student attendance files, etc.)
- Idiosyncratic versions have commonalities across analyst versions
- Separate data requests completed by different analysts yield conflicting results (e.g. a school mean test score)

## Database connections

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- Databases (e.g., SQL, Oracle, Access, etc.) allow for basic data base connectivity:
  - Open Database Connectivity (ODBC)
  - Object Linking and Embedding Database (OLEDB)
  - These are often standard on computers
- ODBC/OLEDB connections are frameworks to allow data manipulation software (e.g. Excel, SPSS, SAS) to communicate with databases

# Road map to data connectivity



Step 4.  
Summarize raw data

Step 3.  
Retrieve raw data

Step 2.  
Connect to ODBC  
Data Source

Step 1.  
Create new ODBC  
Data Source

## Data connectivity example

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- To follow the steps in our road map to connectivity, let's assume the following example:
  - District leadership has asked us to examine reading achievement as measured by reading assessment achievement levels
  - Leadership is specifically interested in 6<sup>th</sup> grade student performance
  - They want to examine performance by student Limited English Proficient (LEP) status.
  - The data we need to obtain are stored in an Access database

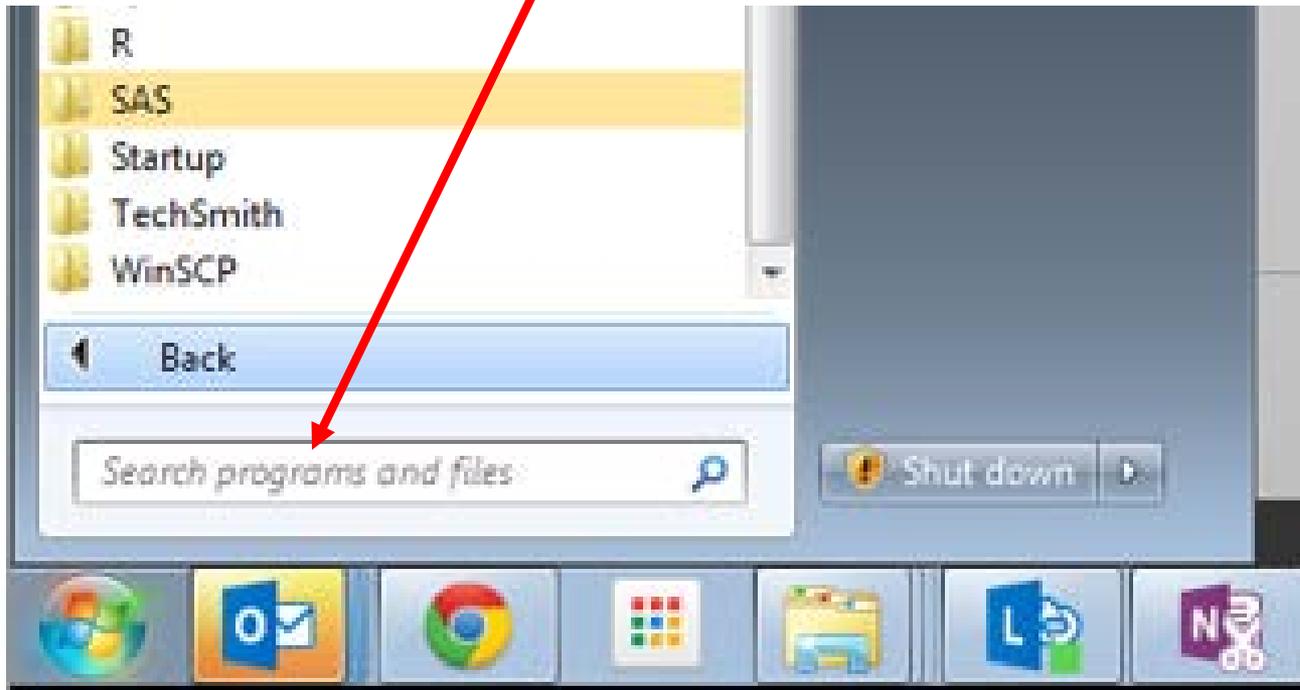
## Creating an ODBC data source

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- The first step is to create an ODBC Data Source centered on an existing database such as Access, SQL, or Oracle. ODBC Data Sources are frameworks, or linkages for software packages such as Excel to communicate with databases

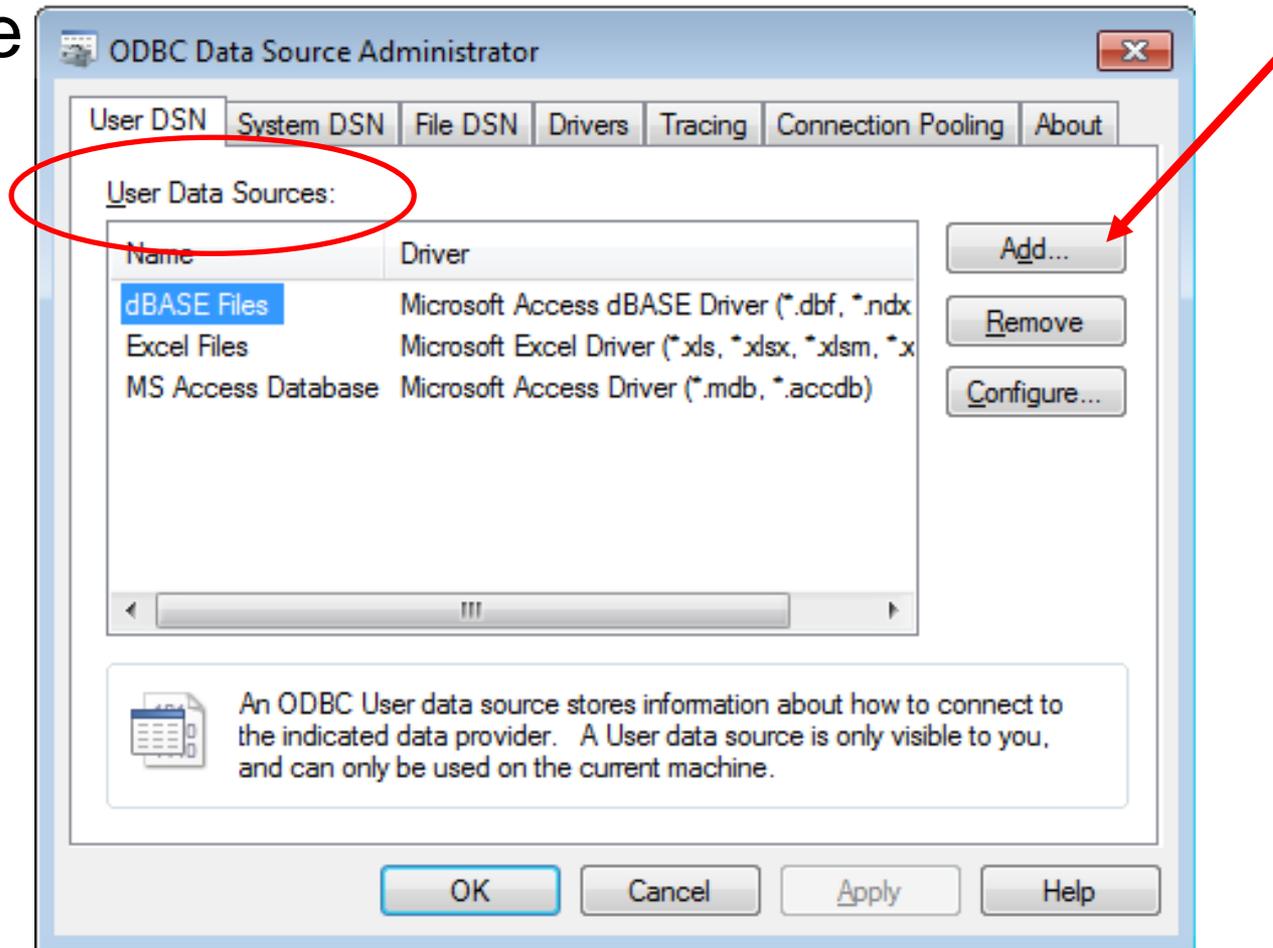
# Open ODBC administrator window

- Type 'ODBC' in Search Box and press Enter



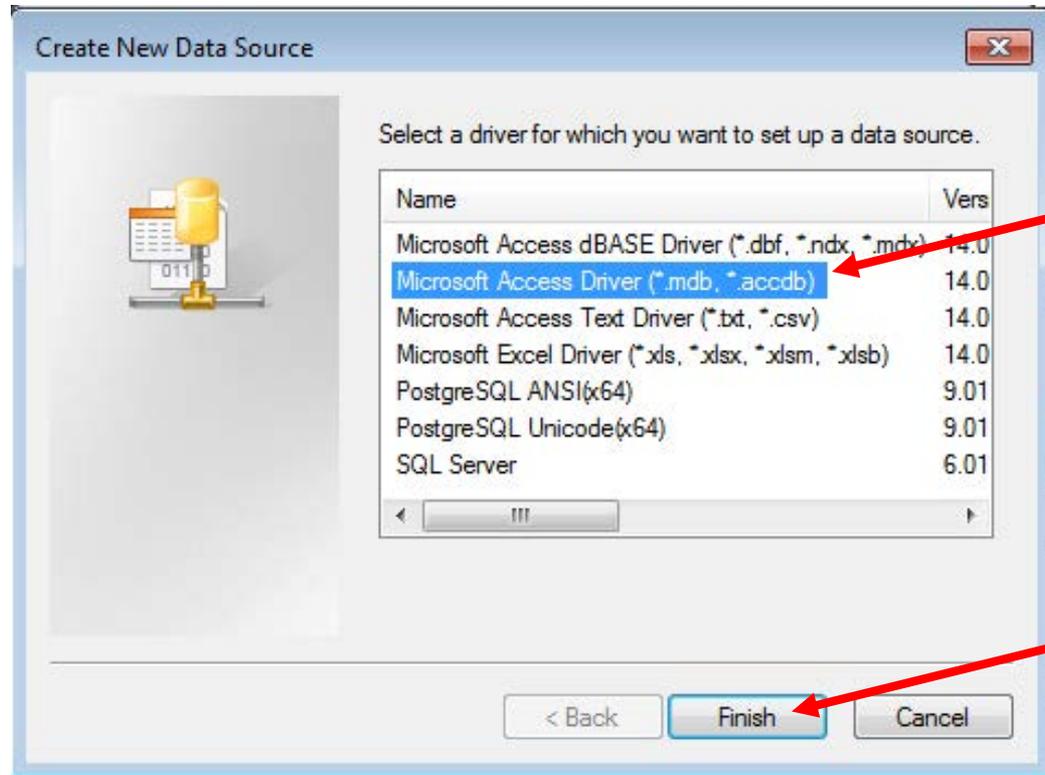
# Add a new data source

- Click 'Add' to begin adding a new ODBC data source



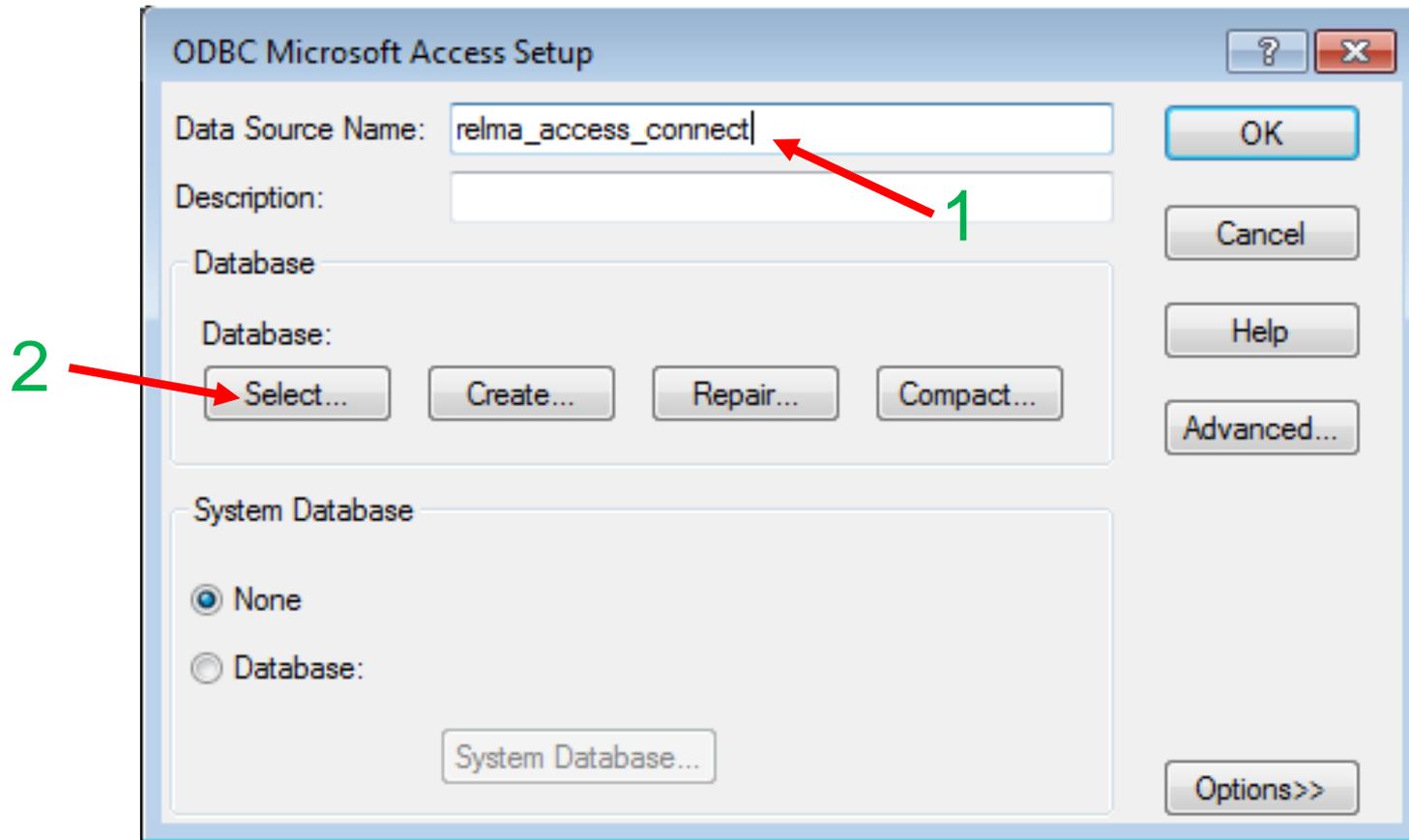
## Choose a driver for the data source

1. Choose driver for connection to a source (in this example, we connect to an Access database)
2. Click Finish



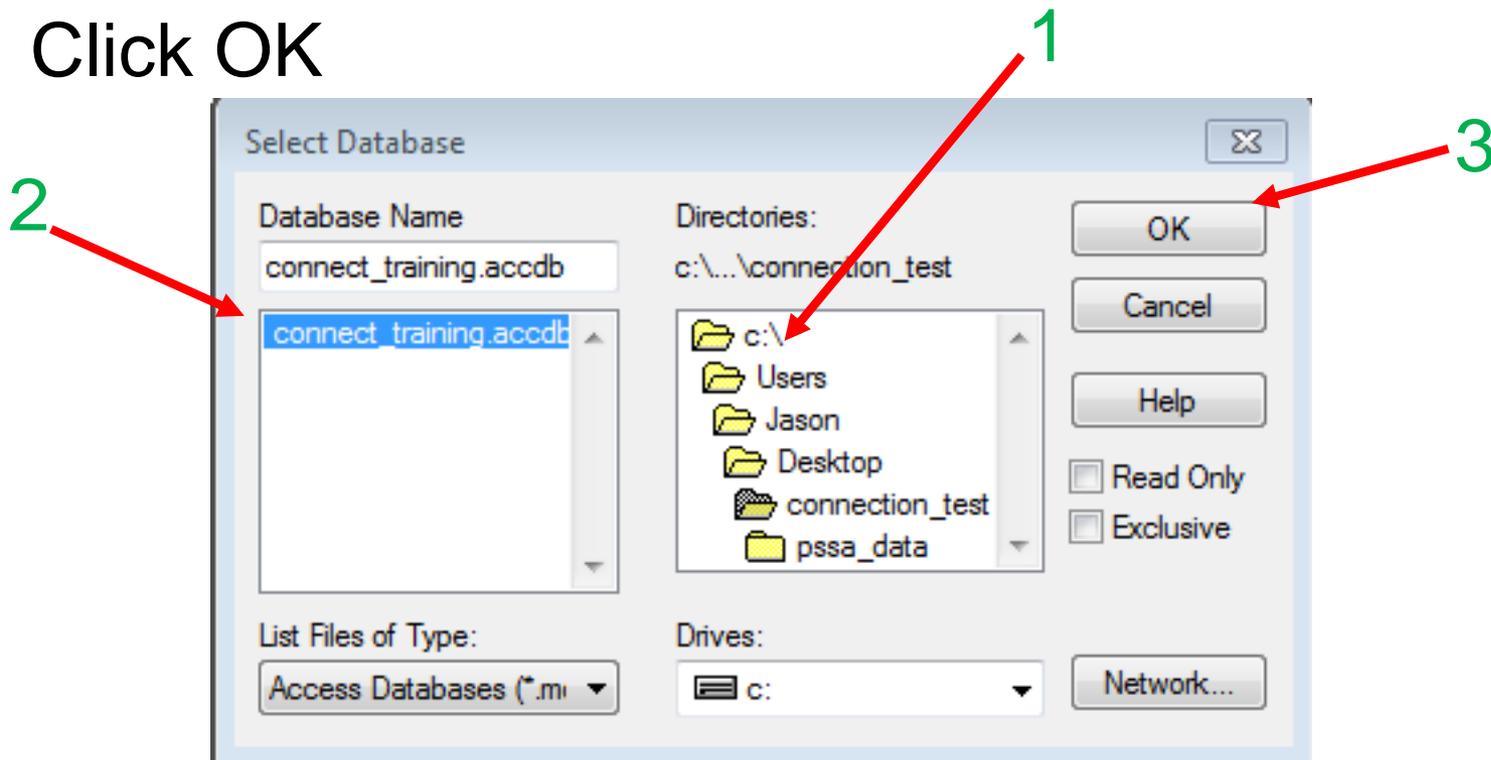
## Name the database connection

1. Name the connection to the database
2. Click Select button under Database



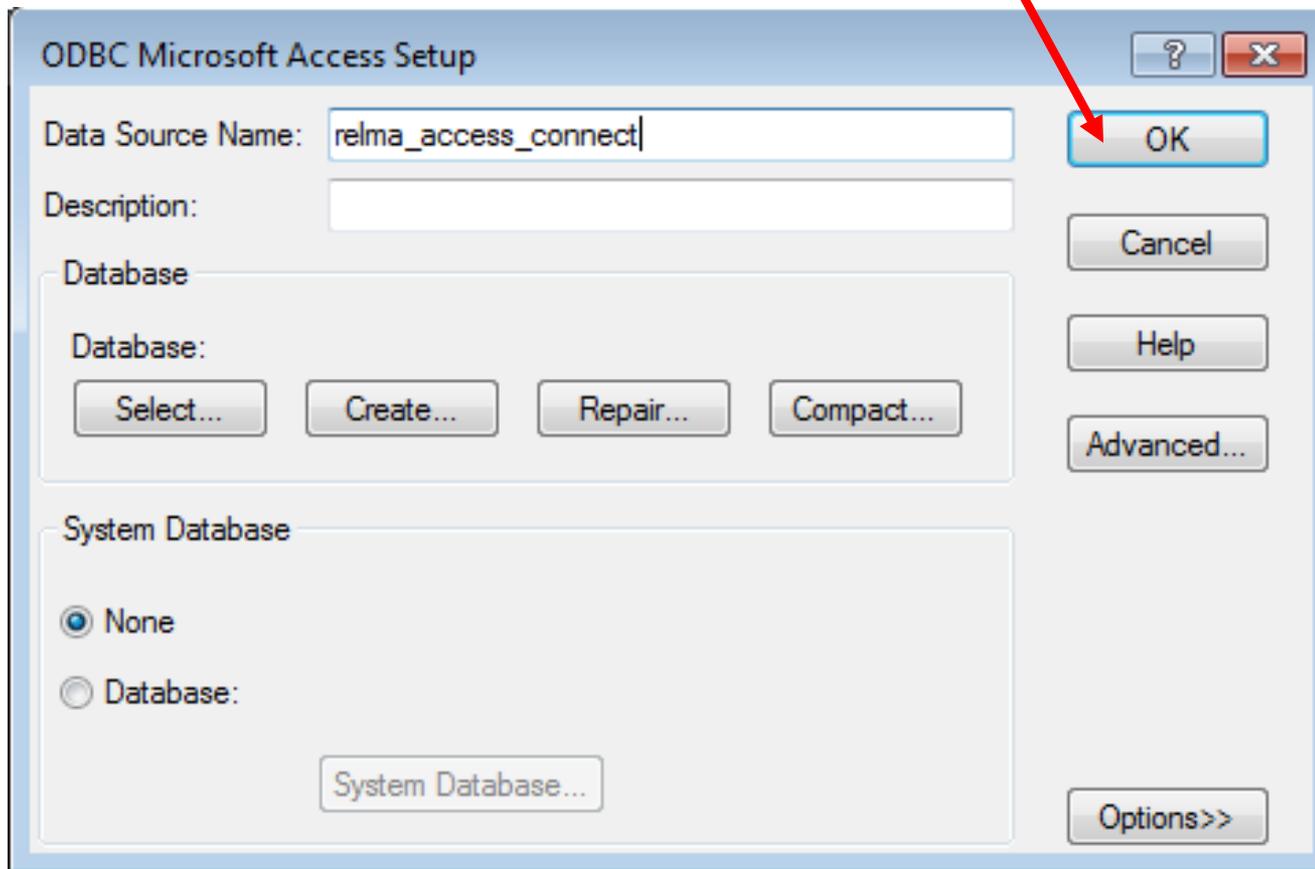
## Link to the source database

1. Navigate to location of the database (the Access database we want to connect to in this example)
2. Select source database
3. Click OK



## Click OK for data source name

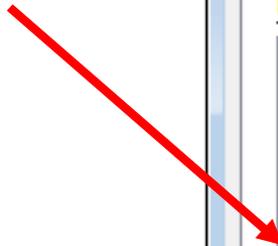
- Click OK button under Database



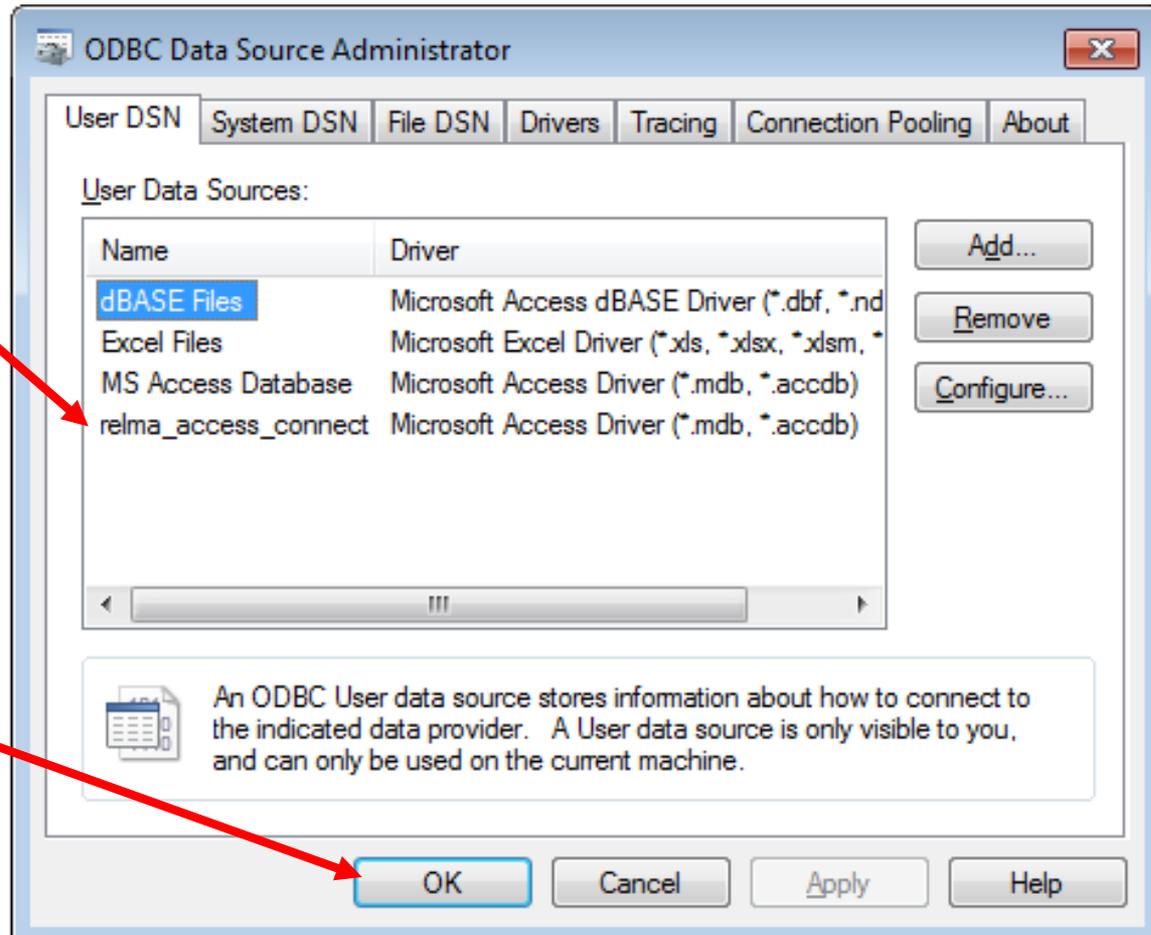
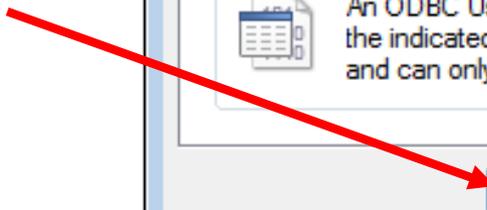
# New data source appears in ODBC directory

1. New data source listed in ODBC directory
2. Click OK

1



2



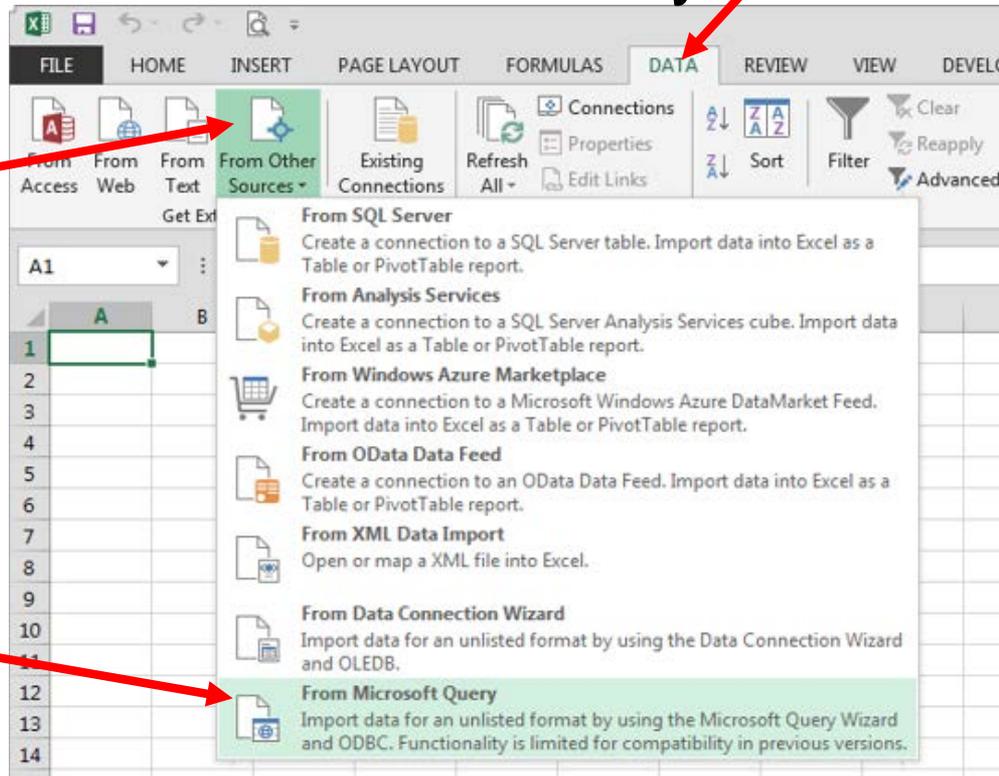
# Connecting to a Database

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- Now that our ODBC data source exists for communicating with the database, the information in the database can be extracted directly into other software packages (e.g. Excel) for further manipulation

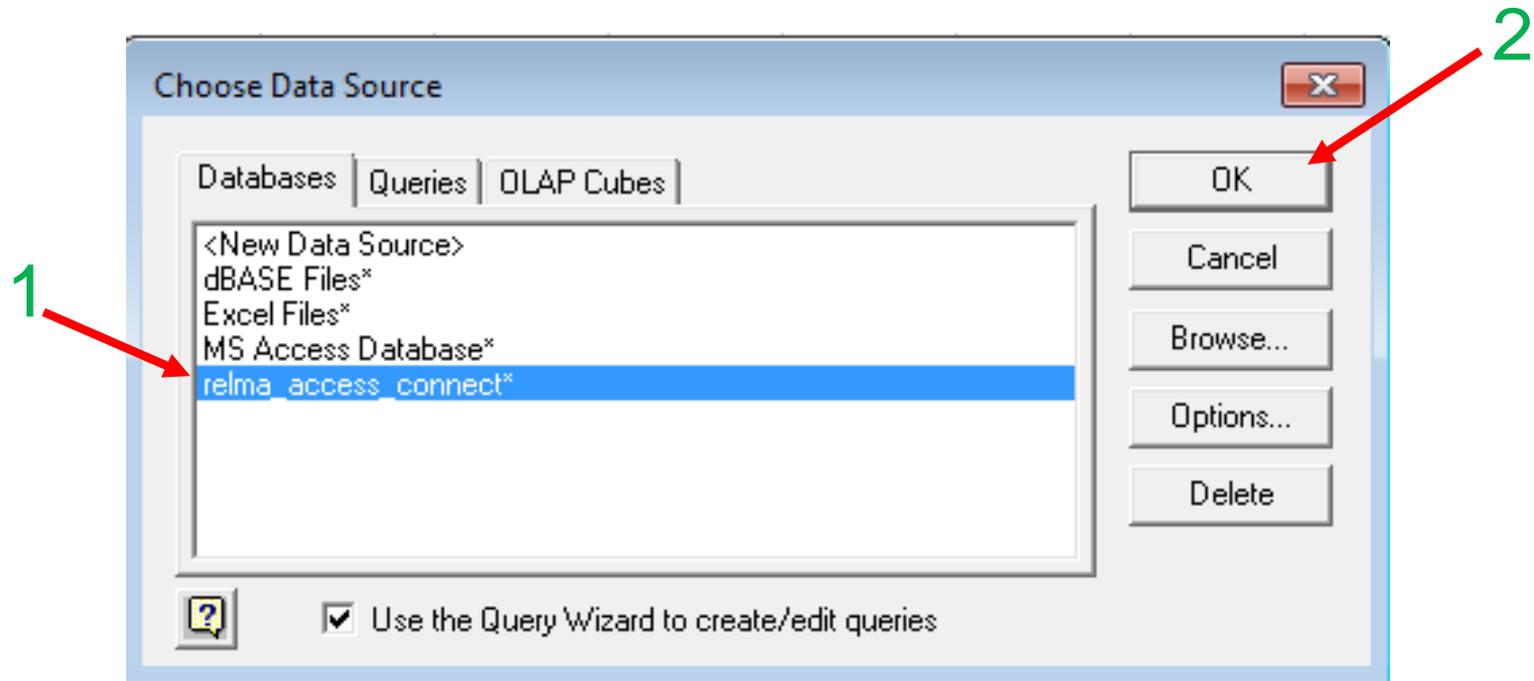
# Connect to database using Excel

1. Navigate to the Data tab in Excel
2. Click on From Other Sources
3. Select From Microsoft Query



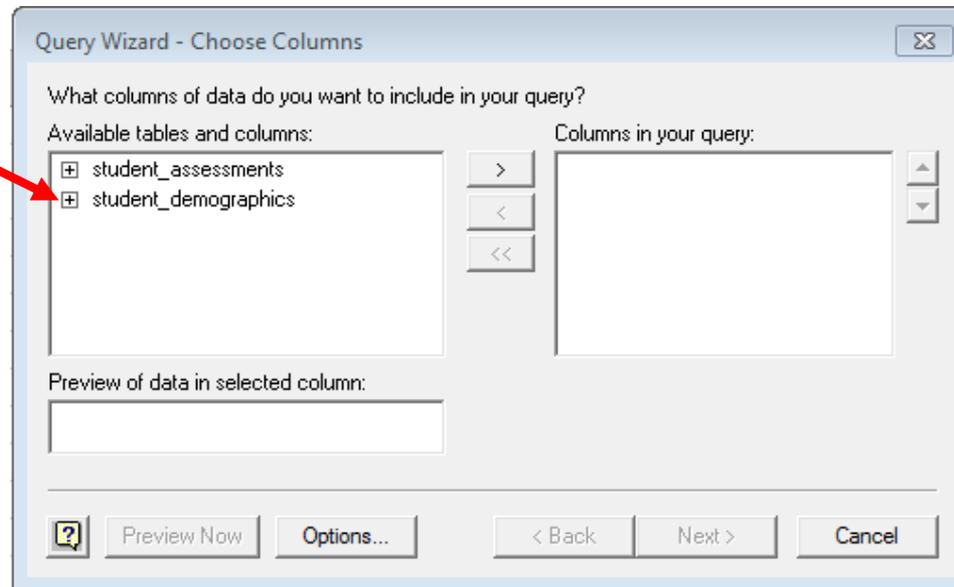
## Choose your data source

1. Select the data source of interest (in this example, the relma\_access\_connect data source)
2. Click OK



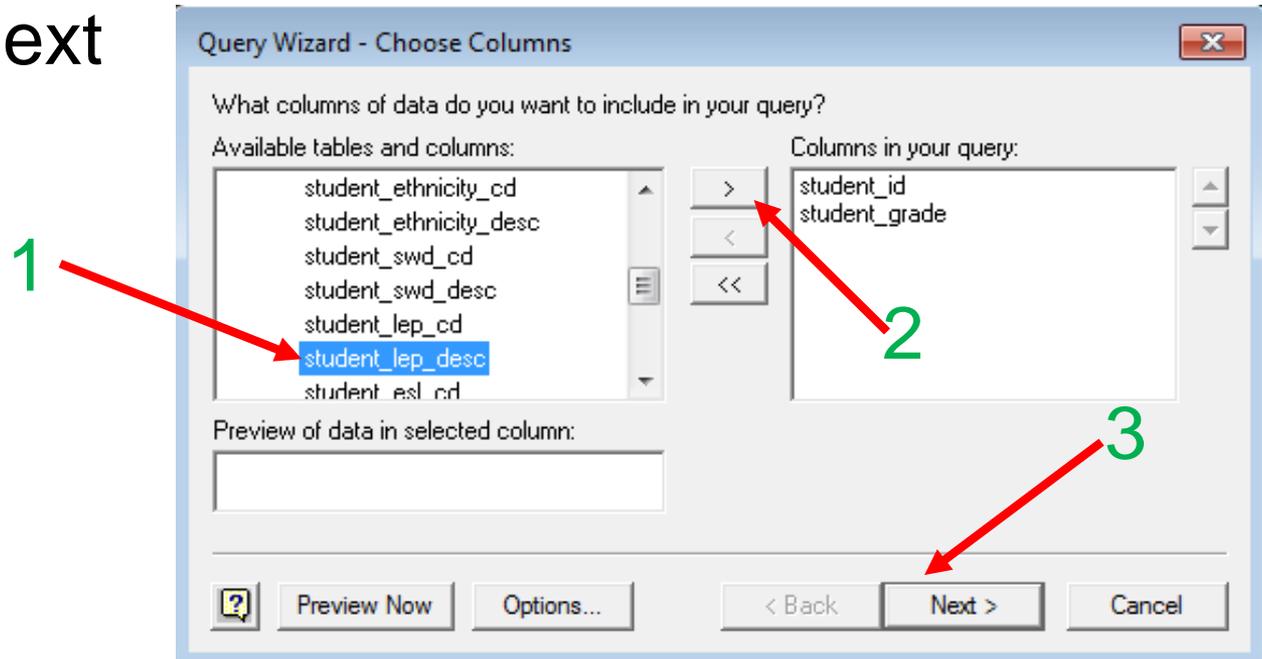
## View available tables in data source

- Now we can view data tables in the database
  - student\_assessments table
  - student\_demographics table
- Press ‘+’ button to list variables in student\_demographics table



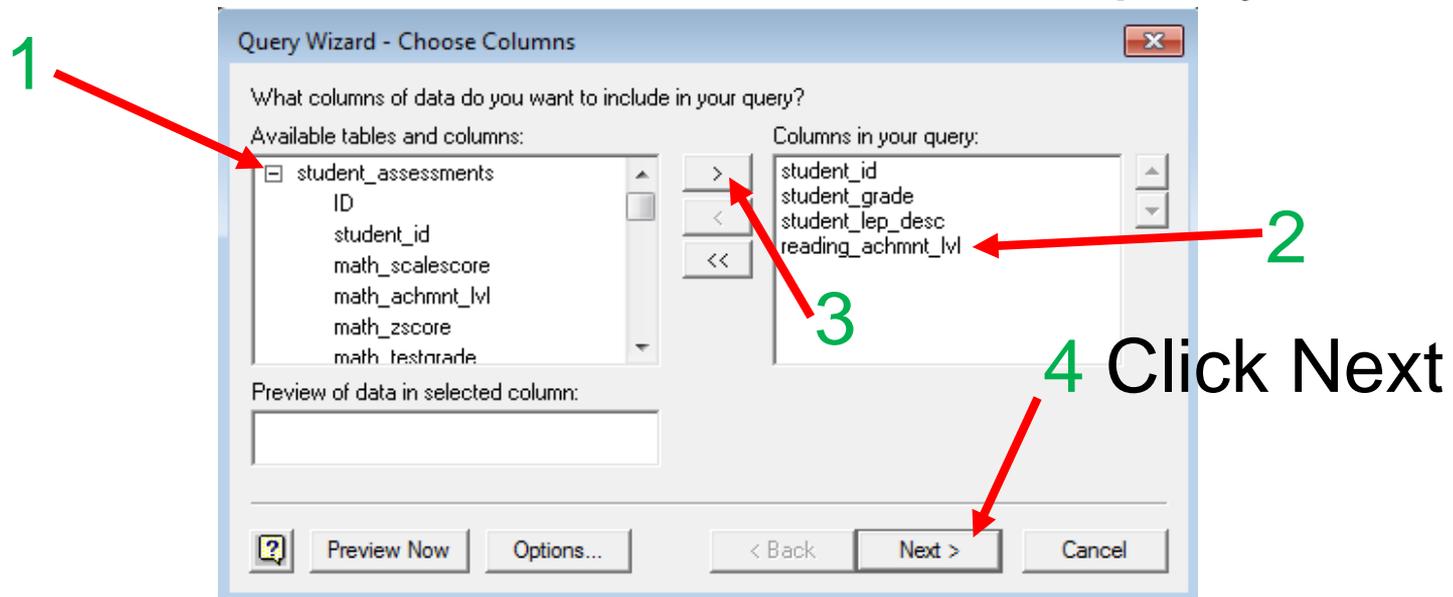
## Select demographic variables

1. Click on variables in student\_demographics table
2. Click '>' arrow to move variables to query window
  - a) Student\_id (student identification number)
  - b) Student\_grade (student grade level)
  - c) Student\_lep\_desc (student LEP status description)
3. Click Next



## Select assessment variables

1. Press '+' to list variables in student\_assessments table
2. Select variables (reading\_achmnt\_lvl) from student\_assessments table
3. Click '>' arrow to move variable to query window



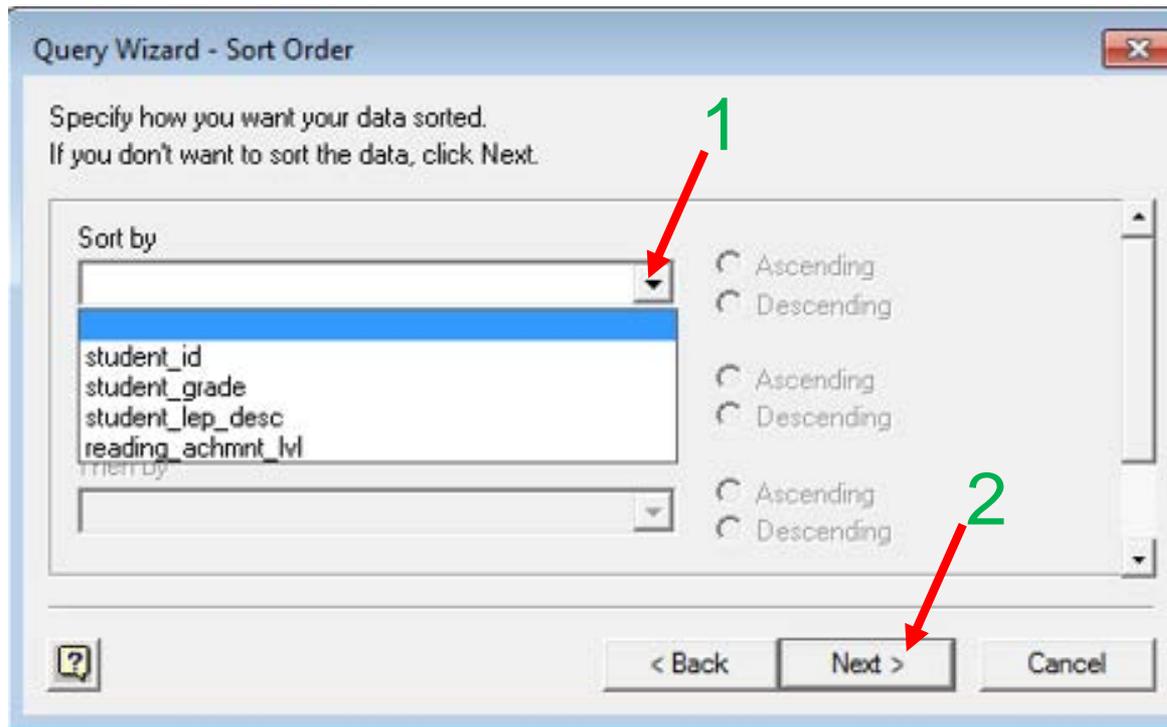
## Filter data during data retrieval

- Returned data can be filtered during retrieval
  - Select student\_grade from Column to filter window
  - Use drop-down to select criteria operation ('=')
  - Select '06' to return only 6<sup>th</sup> grade student data

The screenshot shows the 'Query Wizard - Filter Data' dialog box. It has a title bar with a close button. The main area contains instructions: 'Filter the data to specify which rows to include in your query. If you don't want to filter the data, click Next.' Below this, there are two main sections: 'Column to filter:' and 'Only include rows where:'. The 'Column to filter:' section has a list box with 'student\_id', 'student\_grade' (highlighted), 'student\_lep\_desc', and 'reading\_achmnt\_lvl'. A red arrow labeled '1' points to 'student\_grade'. The 'Only include rows where:' section has a dropdown menu showing 'equals', a radio button for 'And', and a list box with '06', '06' (highlighted), '07', and '08'. A red arrow labeled '2' points to the 'equals' dropdown, and another red arrow labeled '3' points to the '06' in the list box. At the bottom, there are buttons for '< Back', 'Next >', and 'Cancel'. A red arrow labeled '4' points to the 'Next >' button, with the text '4 Click Next' next to it.

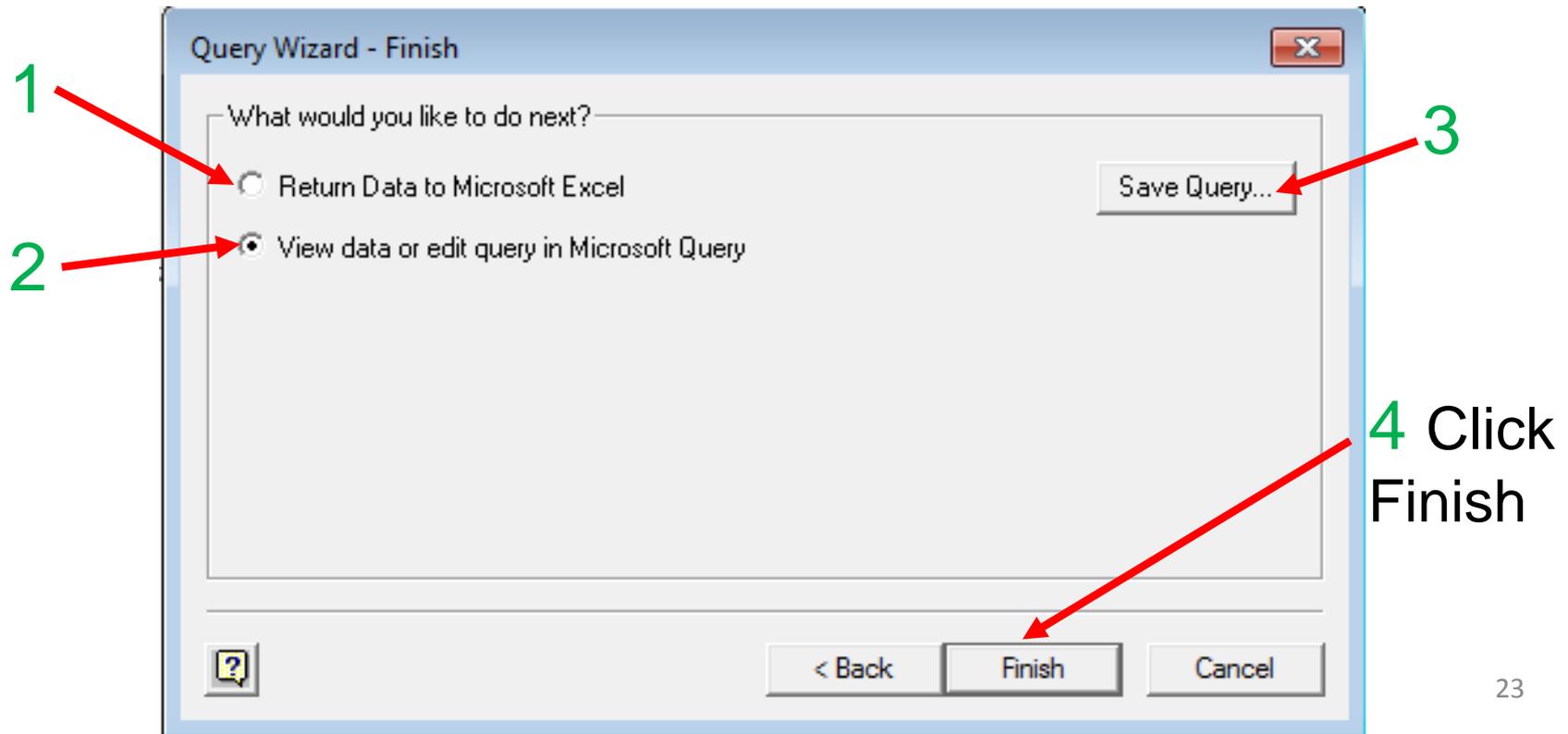
## Sort data during data retrieval

- The query can sort returned data during retrieval
  1. Use drop-down to select variable to sort data by (in this example, we do not wish to sort our data)
  2. Click Next



## Select how you wish to view the results

1. Results can be immediately returned to Excel, or
2. Query can be viewed/edited further and
3. Query can be saved



# Results in Microsoft Query

Table joins depict relationships (Access creates 'ID' column in each table and joins tables by default)

Filter criteria

Retrieved data preview

Query from relma\_access\_connect

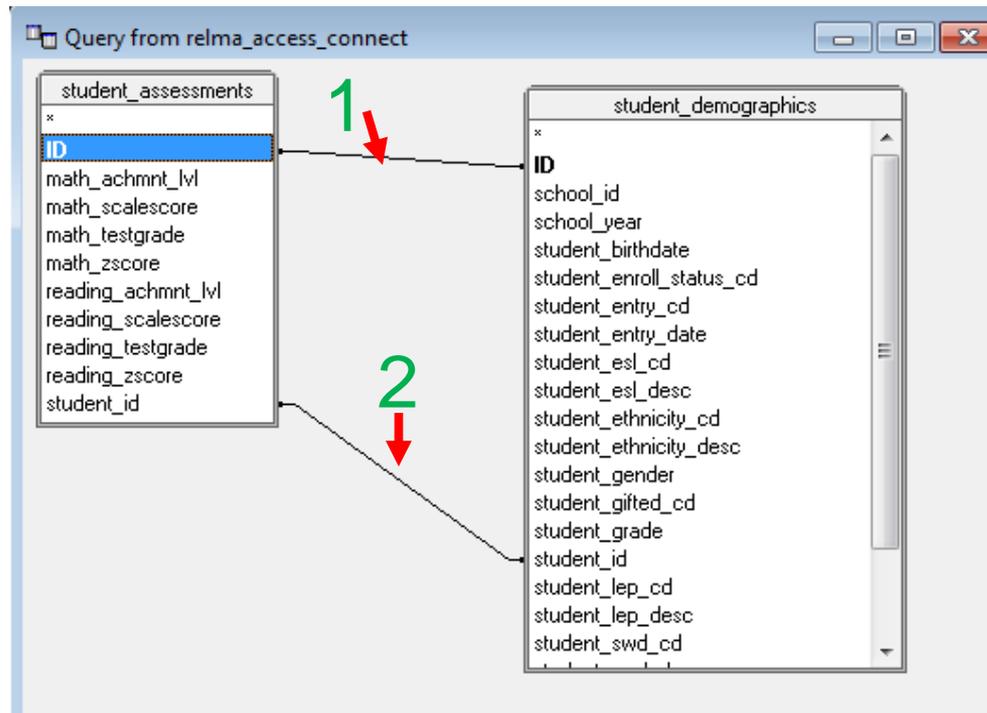
student_assessments	student_demographics
ID	ID
math_achmnt_lvl	school_id
math_scalescore	school_year
math_testgrade	student_birthdate
math_zscore	student_enroll_status_cd
reading_achmnt_lvl	student_entry_cd
reading_scalescore	student_entry_date
reading_testgrade	student_esl_cd
reading_zscore	student_esl_desc
student_id	student_ethnicity_cd
	student_ethnicity_desc
	student_gender
	student_gifted_cd
	student_grade
	student_id
	student_lep_cd
	student_lep_desc
	student_swd_cd

Criteria Field: student\_grade  
Value: '06'  
or:

student_id	student_grade	student_lep_desc	reading_achmnt_lvl
1412767	06	LEP with End Date	2.0
1668822	06	LEP with End Date	1.0
8281080	06	LEP with End Date	1.0
8282887	06	LEP with End Date	1.0
8284052	06	LEP with End Date	2.0
8289278	06	LEP with End Date	1.0

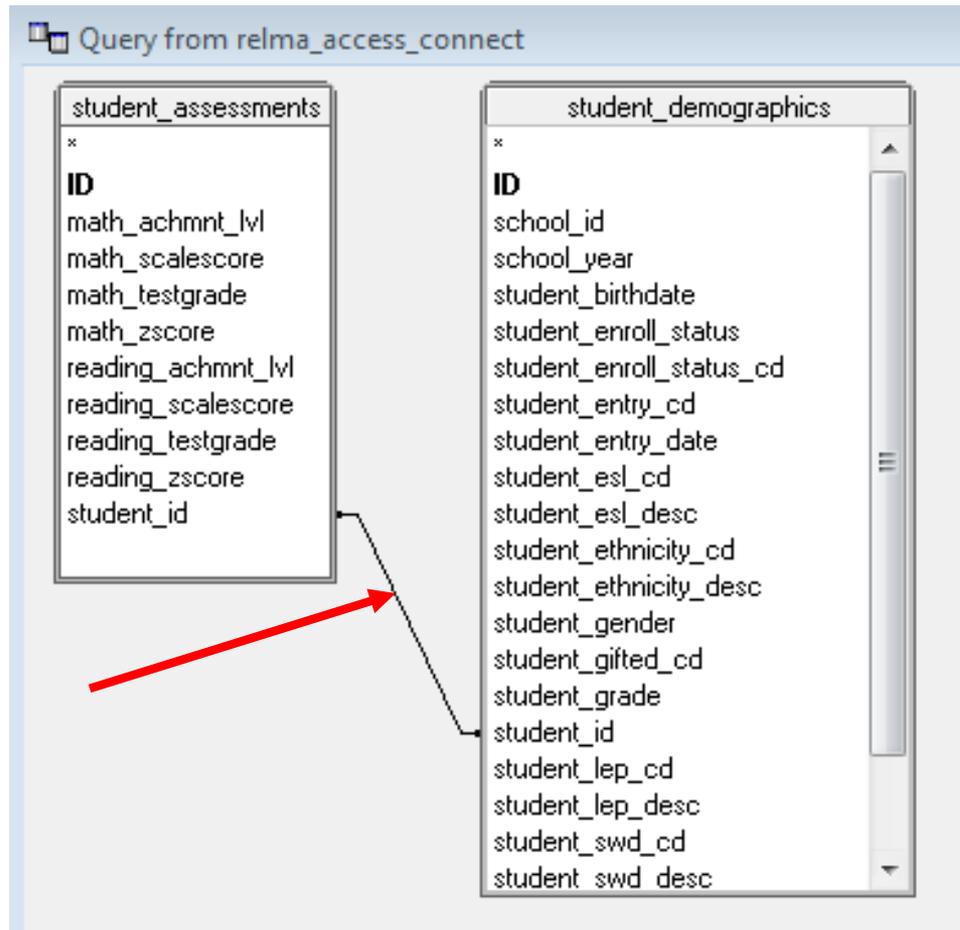
# Adding/deleting relationships

1. Click on join to select, press 'Delete' to remove ID-to-ID relationship
2. Click and hold on variable in one table, drag mouse to corresponding field in other table (in this example, create relationship from student\_id-to-student\_id)



# Changing the nature of relationships

- Double-click on student\_id-to-student\_id join



# Changing the nature of relationships

1. Change variables to join on using drop-downs
2. Change type of join using radio button

- a) Join 1 returns *only* records with matching student\_ids in both tables
- b) Join 2 returns *all* records from student\_assessments and records with matches in student\_demographics
- c) Join 3 returns *all* records from student\_demographics and records with matches in student\_assessments

Joins

Left: student\_assessments Operator: = Right: student\_demographic

Join Includes

- 1: ONLY records from 'student\_assessments' and 'student\_demographics' where student\_assessments.student\_id =
- 2: ALL values from 'student\_assessments' and ONLY records from 'student\_demographics' where student\_assessments.student\_id =
- 3: ALL values from 'student\_demographics' and ONLY records from 'student\_assessments' where student\_assessments.student\_id =

Joins in Query:

student\_assessments INNER JOIN student\_demographics ON student\_assessment

<End of list>

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# Changing relationships – this example

1. Joining on common student\_id variables is appropriate for our example
2. Our join (1) is appropriate for comparing performance of LEP students
3. Click Close

1

2

3

Joins

Left: student\_assessments Operator: = Right: student\_demographics

Join Includes

- 1: ONLY records from 'student\_assessments' and 'student\_demographics' where student\_assessments.student\_id =
- 2: ALL values from 'student\_assessments' and ONLY records from 'student\_demographics' where student\_assessments.student\_id =
- 3: ALL values from 'student\_demographics' and ONLY records from 'student\_assessments' where student\_assessments.student\_id =

Joins in Query:

```
student_assessments INNER JOIN student_demographics ON student_assessment...
```

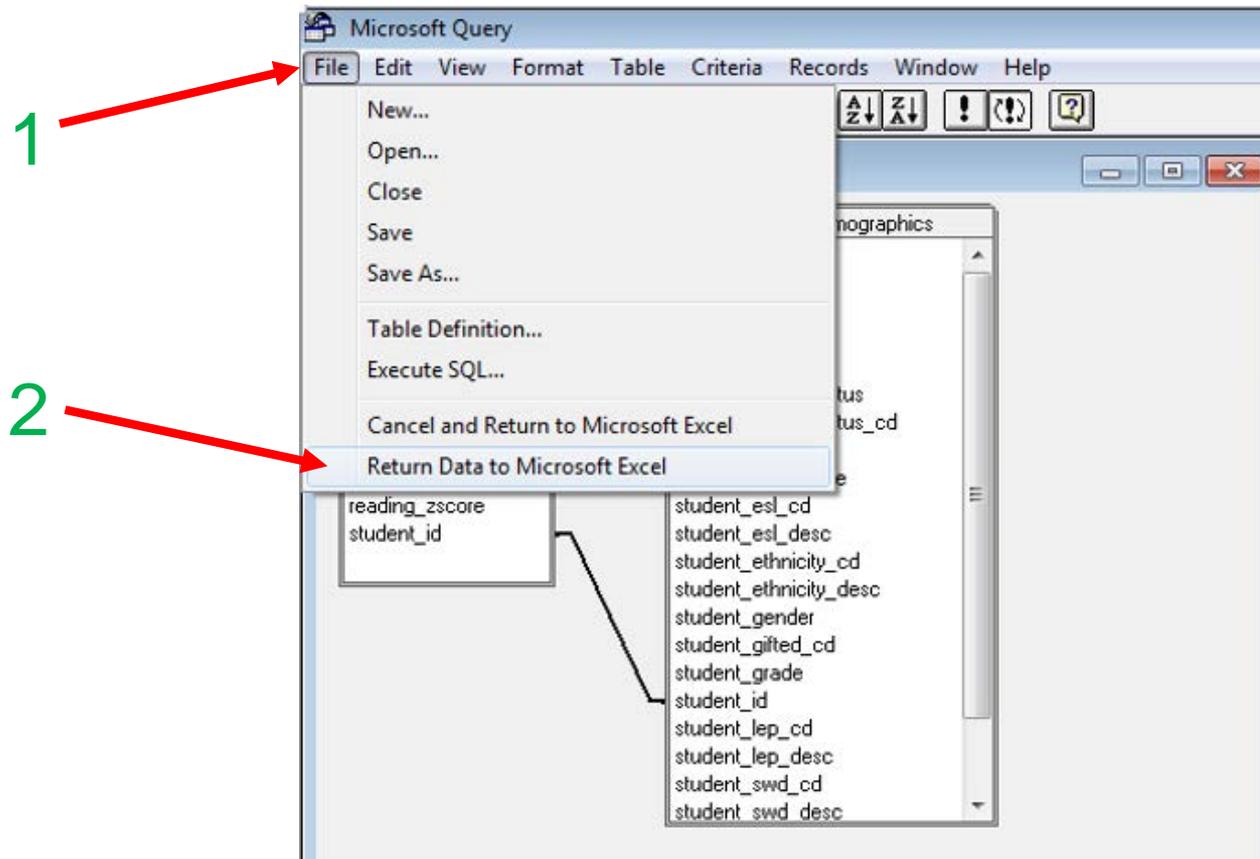
<End of list>

Remove

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# Return data to Excel

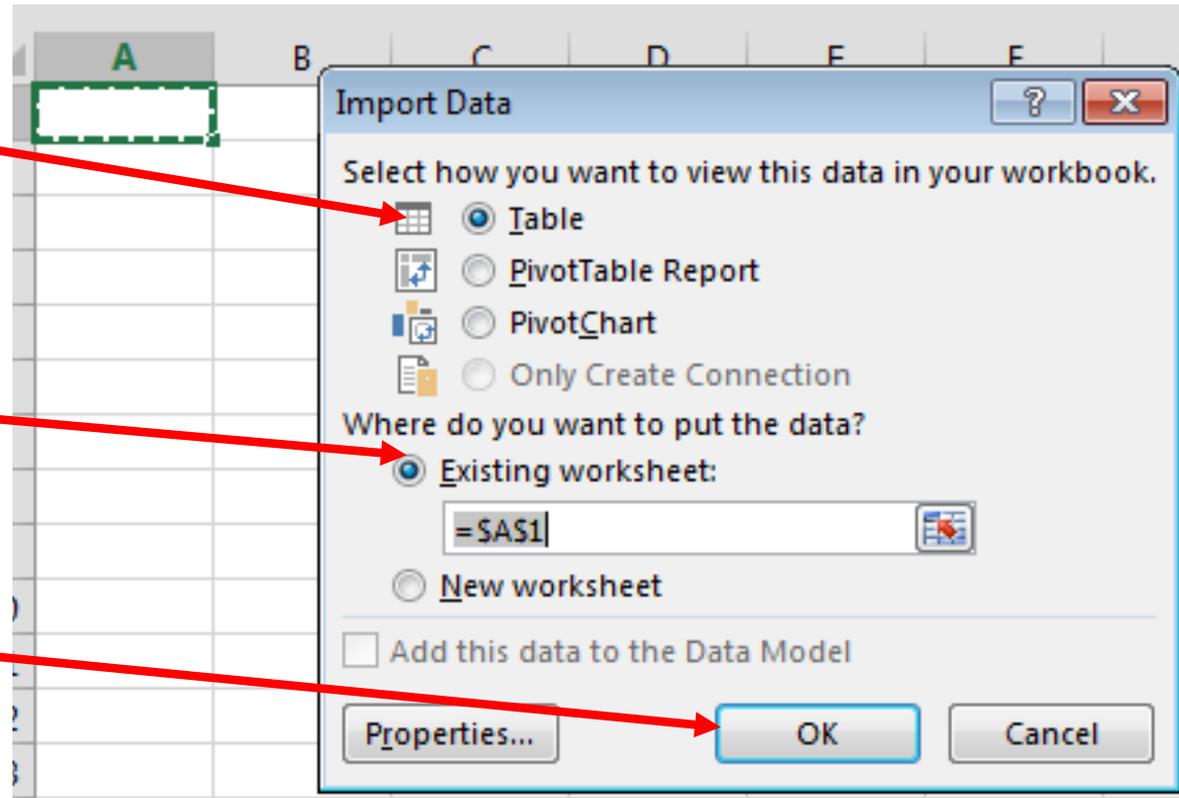
1. Click File
2. Select Return Data to Excel



## Specify data type and destination

- Import Data window allows user to choose data type and destination

1. Leave 'view' as Table for raw data
2. Leave Existing Worksheet as destination
3. Click OK



# Retrieved data in table form

- Resulting data returned to Excel, ready for analysis

	A	B	C	D
1	student_id	student_grade	student_lep_desc	reading_achmnt_lvl
2	1668822	06	LEP with End Date	3
3	8281080	06	LEP with End Date	3
4	8282887	06	LEP with End Date	2
5	8284052	06	LEP with End Date	2
6	8289278	06	LEP with End Date	2
7	8294530	06	LEP with End Date	3
8	8298963	06	LEP with End Date	3
9	8299248	06	LEP with End Date	3
10	8300223	06	LEP with End Date	3
11	8300224	06	LEP with End Date	3
12	8300231	06	LEP with End Date	3
13	8300348	06	LEP with End Date	3
14	8300497	06	LEP with End Date	3
15	8300691	06	LEP with End Date	2
16	8301520	06	LEP with End Date	3
17	8302185	06	LEP with End Date	3
18	8302353	06	LEP with End Date	2
19	8302743	06	LEP with End Date	3
20	8303188	06	LEP with End Date	3

## Summarize data using a connection

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- If we want something that is more friendly for leadership, we may want to summarize the raw data
- Data summaries can be updated using database connections. In Excel, PivotTables provide this functionality.

# PivotTable – Using a connection

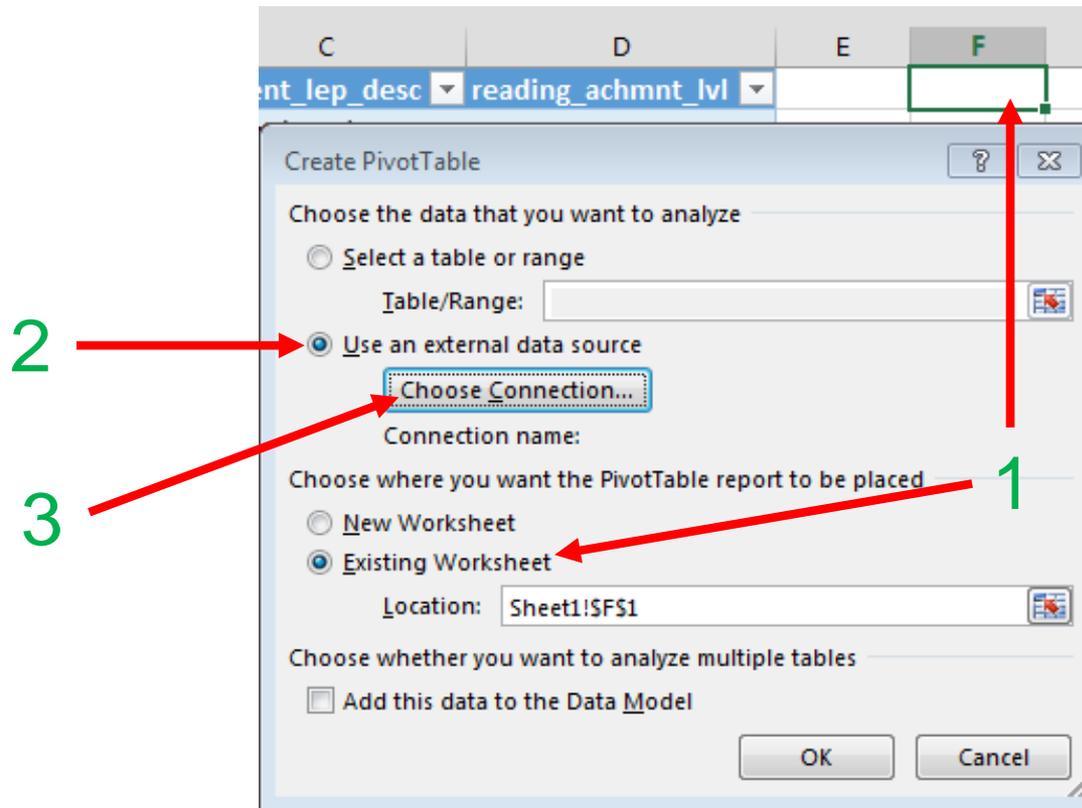
- Let's add a PivotTable to the returned sheet
    - We'll specify reading achievement levels as columns and student LEP status as rows
1. Select Insert tab
  2. Click PivotTable

The screenshot shows the Microsoft Excel interface. The 'INSERT' tab is selected in the ribbon. The 'PivotTable' icon is highlighted with a green box, and a red arrow labeled '2' points to it. A red arrow labeled '1' points to the 'INSERT' tab. Below the ribbon, a data table is visible with columns for student\_id, student\_grade, student\_lep\_desc, and reading\_achmnt\_lvl.

	A	B	C	D
1	student_id	student_grade	student_lep_desc	reading_achmnt_lvl
2	1668822	06	LEP with End Date	3
3	8281080	06	LEP with End Date	33 3

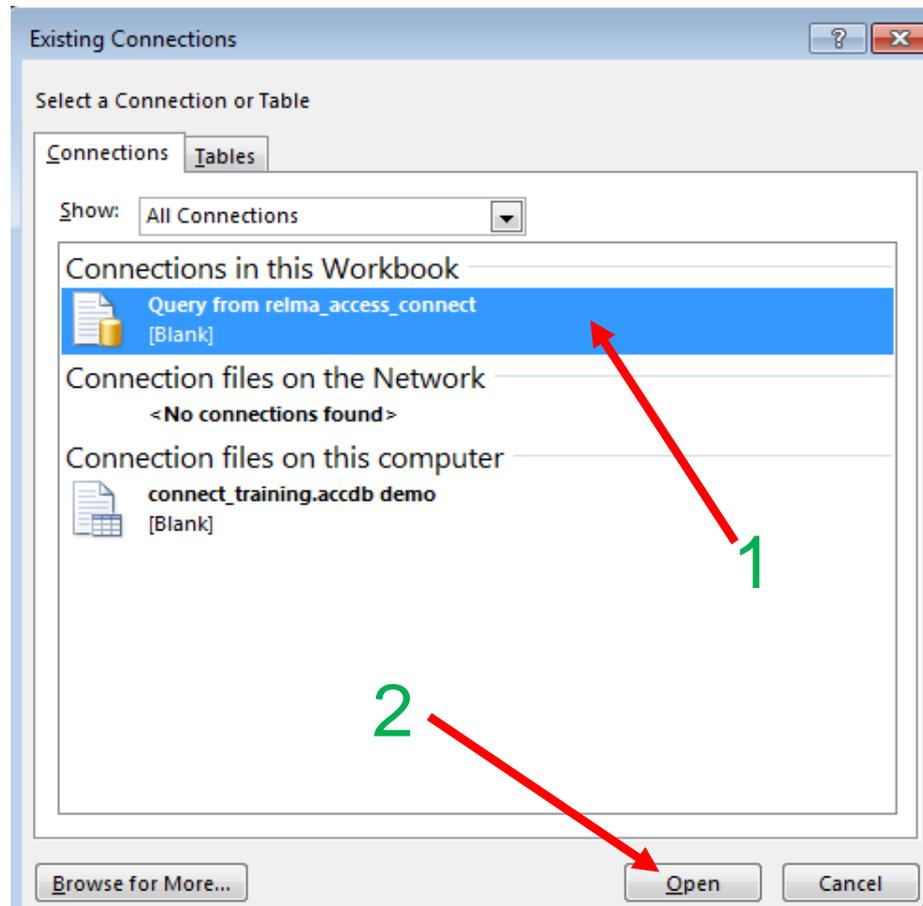
# PivotTable – Identify source data & location

1. Select Existing Worksheet and choose cell F1
2. Select 'Use an external data source
3. Click Choose Connection



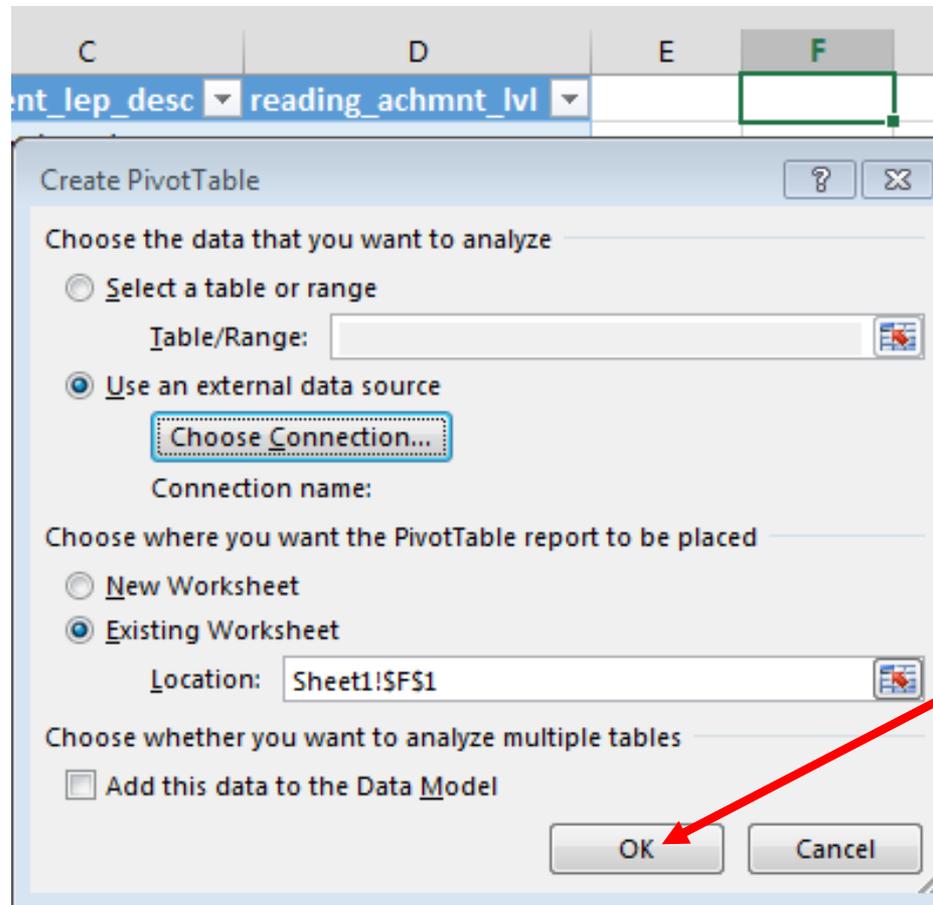
## PivotTable – Select connection

1. Select Query from relma\_access\_connect (this is the query that retrieved our tabular data)
2. Click Open



# PivotTable – Identify source data & location

- Click OK



# PivotTable – Specify rows of summary table

1 Click, hold and drag student\_lep\_desc to ROWS box

The screenshot shows an Excel spreadsheet with a PivotTable named 'PivotTable2' in the range F2:J10. The PivotTable Fields task pane is open on the right side of the window. The task pane has a 'Choose fields to add to report:' section with a list of fields: reading\_achmnt\_lvl, student\_grade, student\_id, and student\_lep\_desc. The 'student\_lep\_desc' field is selected. Below this list are four categories: FILTERS, ROWS, COLUMNS, and VALUES. A red arrow points from the 'student\_lep\_desc' field in the list to the 'ROWS' category in the task pane. Another red arrow points from the text '1 Click, hold and drag student\_lep\_desc to ROWS box' to the 'ROWS' category. The spreadsheet grid shows columns F through J and rows 1 through 10. The 'PivotTable2' label is in cell F2. The text 'To build a report, choose fields from the PivotTable Field List' is in cell F3. The 'student\_lep\_desc' field is in the list of fields to add to the report. The 'ROWS' category is empty. The 'VALUES' category is empty. The page number '37' is in the bottom right corner.

# PivotTable - Specify columns of summary table

1 Click, hold and drag reading\_achmnt\_lvl to COLUMNS box

The screenshot shows an Excel PivotTable with the following data:

Row Labels	G	H	I
Currently LEP			
LEP with End Date			
NEVER classified LEP			
Grand Total			

The PivotTable Fields task pane on the right is titled "PivotTable Fields" and contains the following sections:

- Choose fields to add to report:** A list of fields with checkboxes: reading\_achmnt\_lvl, student\_grade, student\_id, and student\_lep\_desc. The checkbox for student\_lep\_desc is checked.
- Drag fields between areas:** A section with a gear icon and a dropdown arrow.
- FILTERS:** An empty section.
- ROWS:** A section containing the field student\_lep\_desc.
- COLUMNS:** An empty section.
- VALUES:** An empty section.

Two red arrows originate from the text on the left. One arrow points from the text "reading\_achmnt\_lvl" to the checkbox for reading\_achmnt\_lvl in the "Choose fields to add to report" section. The other arrow points from the text "to COLUMNS box" to the empty COLUMNS section in the task pane.

# PivotTable - Specify variable to summarize

1 Click, hold and drag student\_id to VALUES box

The screenshot shows an Excel PivotTable with the following structure:

Row Labels	1	2	3	4 (blank)	Grand Total
Currently LEP					
LEP with End Date					
Never classified LEP					
Grand Total					

The PivotTable Fields task pane on the right is configured as follows:

- Choose fields to add to report:**
  - reading\_achmnt\_lvl
  - student\_grade
  - student\_id
  - student\_lep\_desc
- FILTERS:** (empty)
- ROWS:** student\_lep\_desc
- COLUMNS:** reading\_achmnt\_lvl
- VALUES:** (empty)

Two red arrows originate from the text on the left. One arrow points from the text to the **student\_id** field in the task pane. The other arrow points from the text to the **VALUES** area in the task pane, indicating the intended drag action.

# PivotTable – LEP status by achievement level counts

The screenshot displays an Excel PivotTable and its corresponding task pane. The PivotTable is set to count the number of students in each cell of the data source. The task pane shows the following configuration:

- VALUES:** Count of student\_id
- ROWS:** student\_lep\_desc
- COLUMNS:** reading\_achmnt\_lvl

The data source is a table with the following structure:

Count of student_id	Column Labels	1	2	3	4 (blank)	5
Row Labels						
Currently LEP		109	88	68	3	5
LEP with End Date		18	73	241	46	
Never classified LEP		471	542	1196	389	32
Grand Total		598	703	1505	438	37

1 By default, report is counting students in each cell

# PivotTable – Lets polish the table a bit

**PivotTable Fields**

Choose fields to add to report:

- reading\_achmnt\_lvl
- student\_grade
- student\_id
- student\_lep\_desc

Drag fields between areas:

**FILTERS**

**ROWS**

student\_lep\_desc

**COLUMNS**

reading\_achmnt\_lvl

**VALUES**

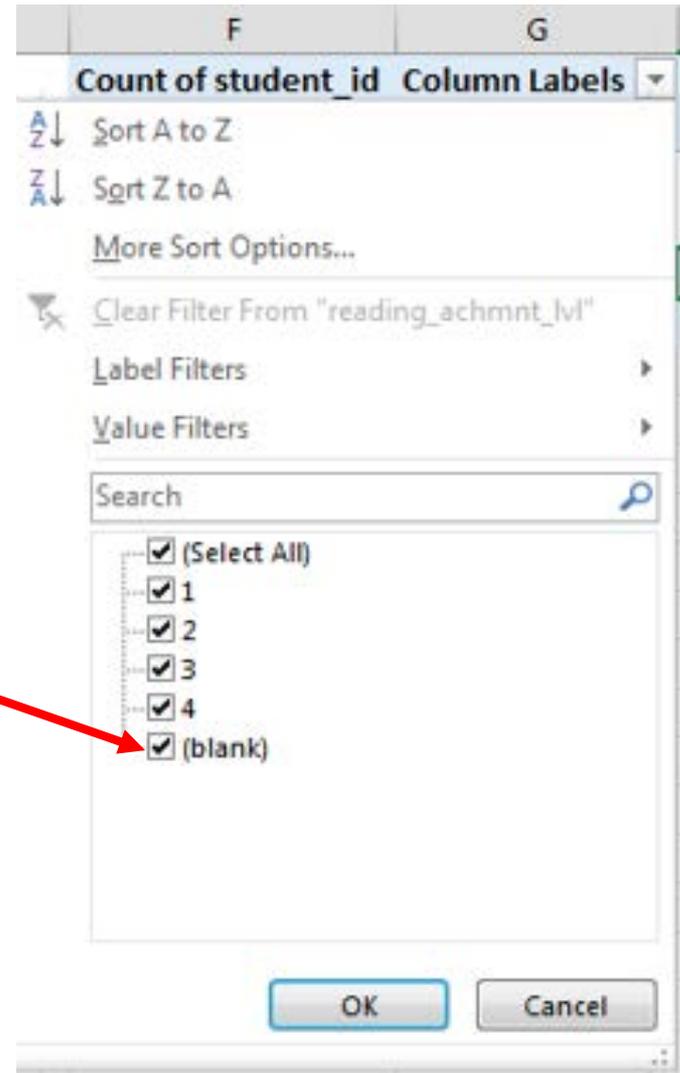
Count of student\_id

Count of student_id	Column Labels	1	2	3	4 (blank)	Grade
Currently LEP		109	88	68	3	5
LEP with End Date		18	73	241	46	
Never classified LEP		471	542	1196	389	32
<b>Grand Total</b>		<b>598</b>	<b>703</b>	<b>1505</b>	<b>438</b>	<b>37</b>

1 Click on the drop-down next to Column Labels

# PivotTable – Using column filters

1 To remove the students without reading achievement levels, let's uncheck (blank) from our Column Labels filter



# PivotTable – Lets polish a bit more

Count of student_id	Column Labels	1	2	3	4	Grand Total
Row Labels						
Currently LEP		109	88	68	3	268
LEP with End Date		18	73	241	46	378
Never classified LEP		471	542	1196	389	2598
<b>Grand Total</b>		<b>598</b>	<b>703</b>	<b>1505</b>	<b>435</b>	<b>3244</b>

### PivotTable Fields

Choose fields to add to report: ⚙️

- reading\_achm...
- student\_grade
- student\_id
- student\_lep\_desc

Drag fields between areas:

**FILTERS**

**ROWS**  
student\_lep\_desc

**COLUMNS**  
reading\_achmnt\_lvl

**VALUES**  
Σ Count of student\_id

1 Blank reading achievement levels have been removed, totals have been updated

2 Click, hold and drag student\_id to VALUES box again

# PivotTable – Adding more summary variables

Column Labels	1	2	3
Row Labels	Count of student_id	Count of student_id2	Count of student_id3
Currently LEP	109	109	84
LEP with End Date	18	18	7
Never classified LEP	471	471	54
<b>Grand Total</b>	<b>598</b>	<b>598</b>	<b>70</b>

### PivotTable Fields

Choose fields to add to report:

- reading\_achm...
- student\_grade
- student\_id
- student\_lep\_desc

Drag fields between areas below:

**FILTERS**

**ROWS**

student\_lep\_desc

**COLUMNS**

reading\_achmnt\_lvl

Σ Values

**VALUES**

Count of student\_id

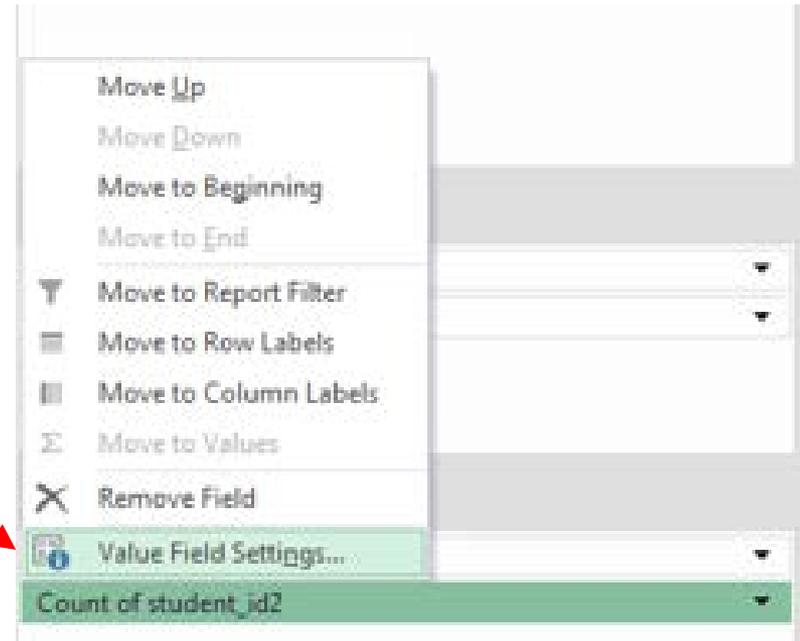
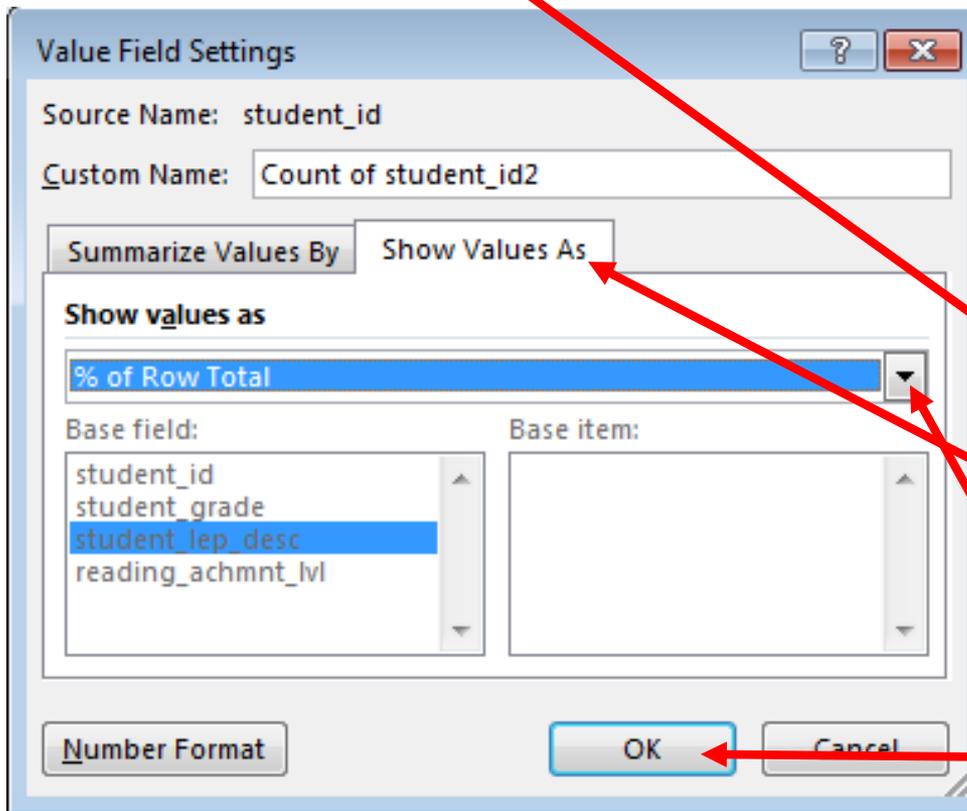
Count of student\_id2

1 Now the counts appear twice in the table and VALUES section

2 Click the drop-down next to our 2<sup>nd</sup> student\_id in VALUES box

# PivotTable – Changing how summaries are displayed

1 Click on Value Field Settings...



2 Click Show Values As tab

3 Use drop-down to select % of Row Total

4 Click OK

## PivotTable – Editing column labels

1. Now we have counts and percentages within LEP status
2. Right click on 'Count of student\_id' in Column G

2

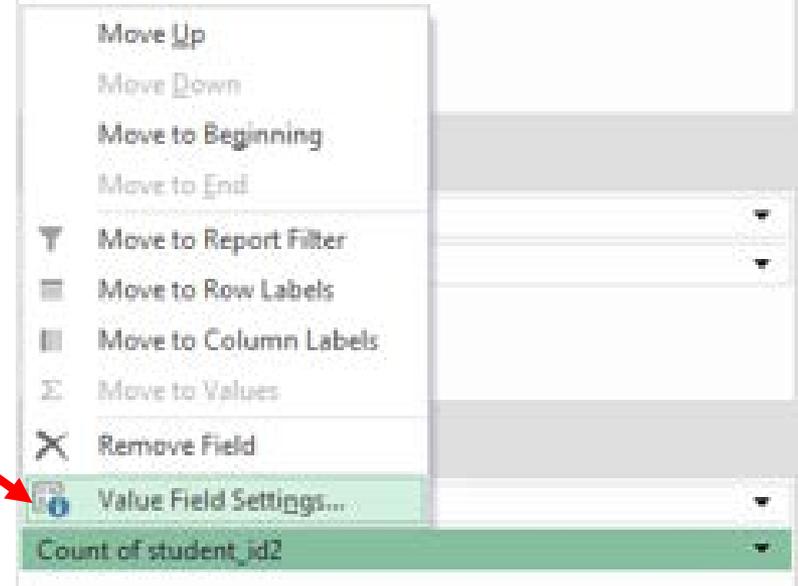
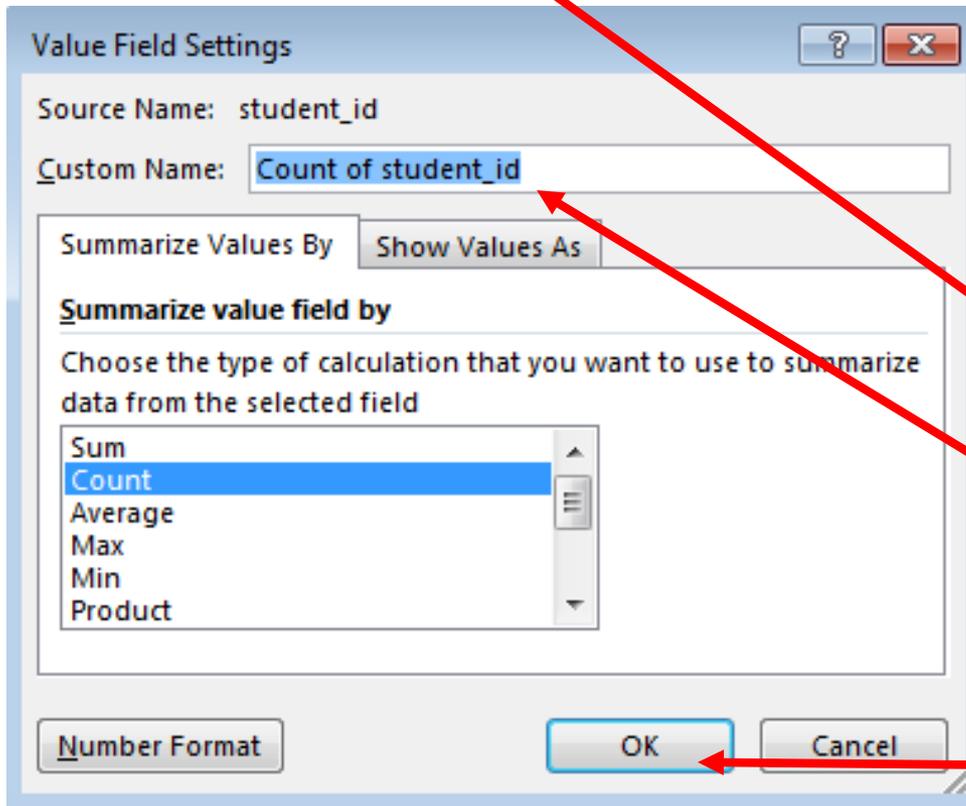
The screenshot shows a PivotTable with the following structure:

	G	H	I	J
Column Labels	1	2		
Row Labels	Count of student_id	Count of student_id2	Count of student_id	Count of student_id2
Currently LEP	109	40.67%	88	32.84%
LEP with End Date	18	4.76%	73	19.31%
Never classified LEP	471	18.13%	542	20.86%
Grand Total	598	18.43%	703	21.67%

Red arrows point from the text 'Right click on 'Count of student\_id' in Column G' to the 'Count of student\_id' header in column G and the 'Count of student\_id2' header in column H. A green box highlights the cell containing '471' in the 'Never classified LEP' row and column G.

# PivotTable – Changing column labels

1 Click on Value Field Settings...



2 Change Count of student\_id label to 'n'

3 Click OK

## PivotTable – Editing column labels

1. Now we have 'n' over our counts, let's add '%' over our percentages
2. Right click on 'Count of student\_id' in Column H

The screenshot shows a PivotTable with the following structure:

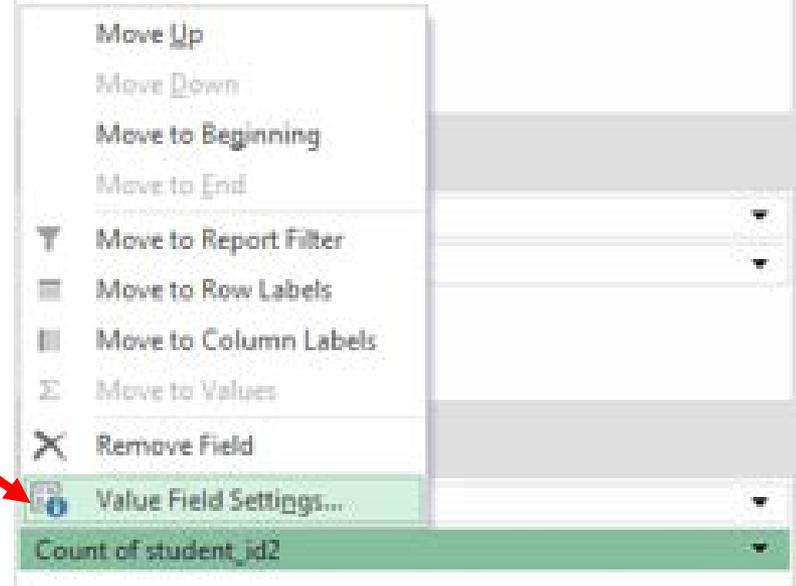
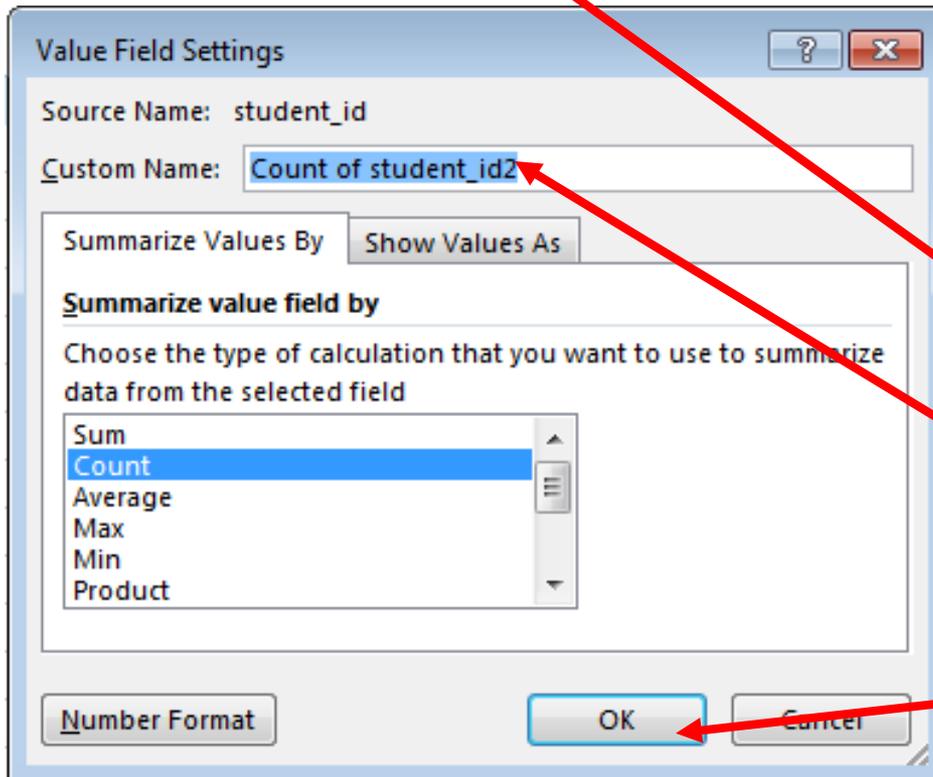
- Column G: Column Labels (dropdown arrow)
- Column H: Count of student\_id2
- Column I: n
- Column J: Count of student\_id2

Row Labels: n

Row Labels	Count of student_id2	n	Count of student_id2
Currently LEP	109	40.67%	88
LEP with End Date	18	4.76%	73
Never classified LEP	471	18.13%	542
<b>Grand Total</b>	<b>598</b>	<b>18.43%</b>	<b>703</b>

# PivotTable – Changing column labels

1 Click on Value Field Settings...



2 Change Count of student\_id2 label to ‘%’

3 Click OK

## PivotTable – Finished product

- Now we have ‘n’ over our counts, and ‘%’ over our percentages
- Adding the percentages quickly reveals for leadership the difference in performance among students of different LEP status
- Should the parameters of the request change, or new data become available, the summary table can quickly be refreshed using the connection

	F	G	H	I	J	K	L	M	N	O	P
	Col1										
		1	2	3	4	Total n		Total %			
Row Labels	n	%	n	%	n	%	n	%			
Currently LEP	109	40.67%	88	32.84%	68	25.37%	3	1.12%	268	100.00%	
LEP with End Date	18	4.76%	73	19.31%	241	63.76%	46	12.17%	378	100.00%	
Never classified LEP	471	18.13%	542	20.86%	1196	46.04%	389	14.97%	2598	100.00%	
<b>Grand Total</b>	<b>598</b>	<b>18.43%</b>	<b>703</b>	<b>21.67%</b>	<b>1505</b>	<b>46.39%</b>	<b>438</b>	<b>13.50%</b>	<b>3244</b>	<b>100.00%</b>	

## Questions/Need help

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Please visit [www.relmidatlantic.org](http://www.relmidatlantic.org) for other data tools!