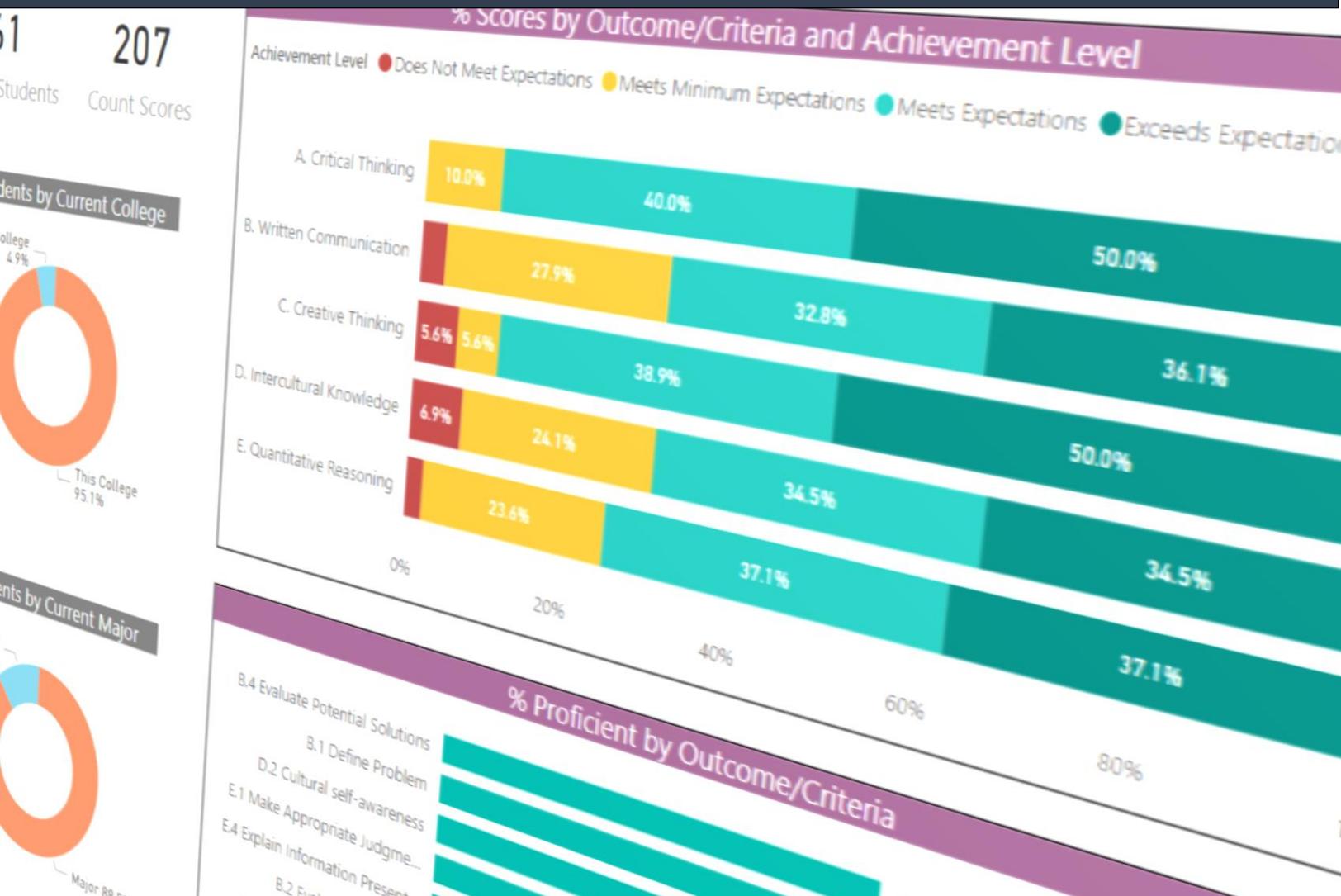


Assessment Dashboard in a Day

Visualizing Assessment Data in Power BI



Fred Burrack, Ph.D. | Director
Chris Urban | Assistant Director



This walkthrough demonstrates a process to create a basic assessment dashboard using Power BI. This guide should be considered a template showing key steps and functions that can be adapted for programmatic or institutional contexts.

Part I: Create the Data Model

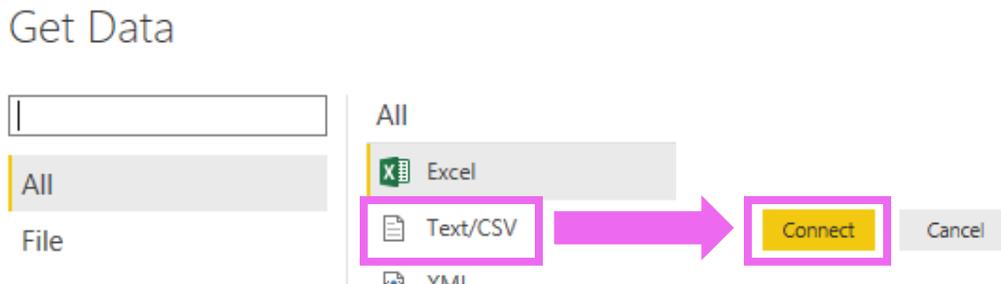
Build the Fact Table

1. Create a new report and get data

Open Power BI Desktop and click **Get Data**



Select **Text/CSV**, then click **Connect**.

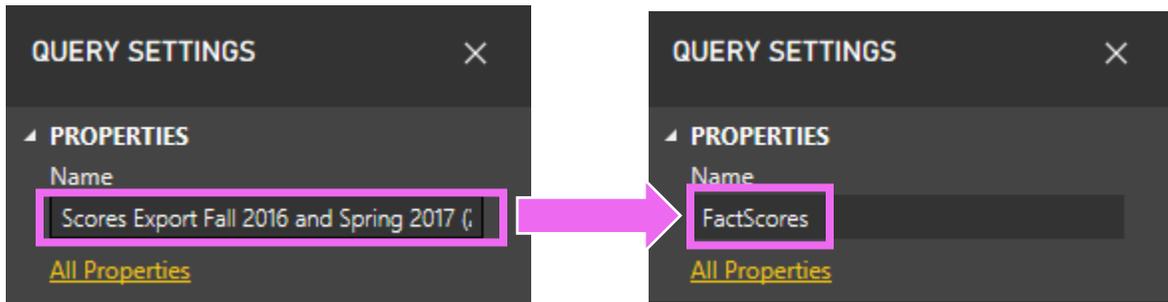


Choose the **Scores Export Fall 2016 and Spring 2017** file and click **Open**. Then click **Edit**.

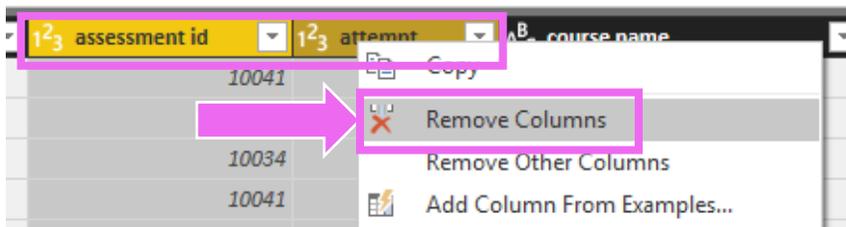


2. Use the Query Editor to Transform the Data

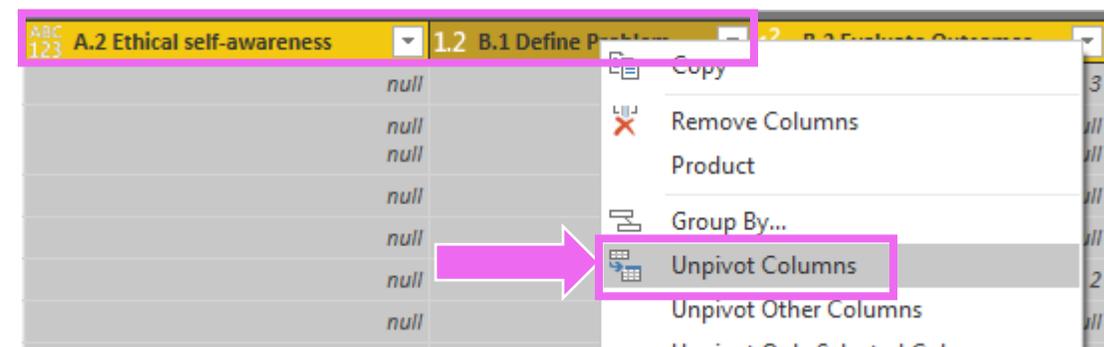
Rename the Query to Fact Scores



Remove unnecessary **assessment id** and **attempt** columns. While holding **Ctrl**, click **column headings** to select columns for removal. Then **right-click** on a **column heading** and click **Remove Columns**.



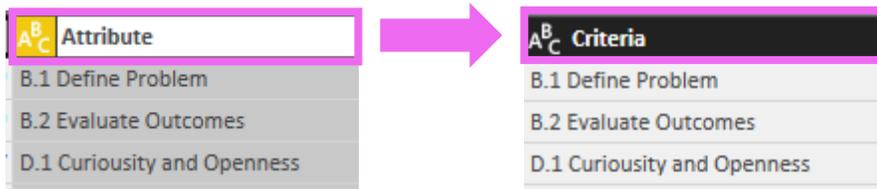
Because this is a fact table, we need to convert some columns into duplicated row values by **Unpivoting Columns**. Select the columns to unpivot (all of the criteria columns) then **right-click** on a **column** and choose **Unpivot Columns**.



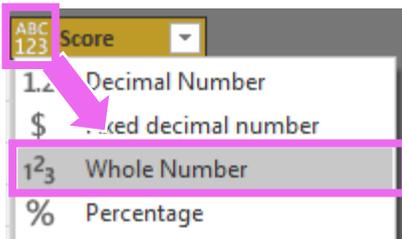
Unpivoting converts these columns into rows.

Attribute	Value
B.1 Define Problem	4
B.2 Evaluate Outcomes	3
D.1 Curiosity and Openness	2

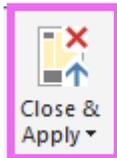
Rename the unpivoted columns. **Double-Click** the **Attribute** column and rename it to **Criteria**. **Rename** the **Value** column to **Score**.



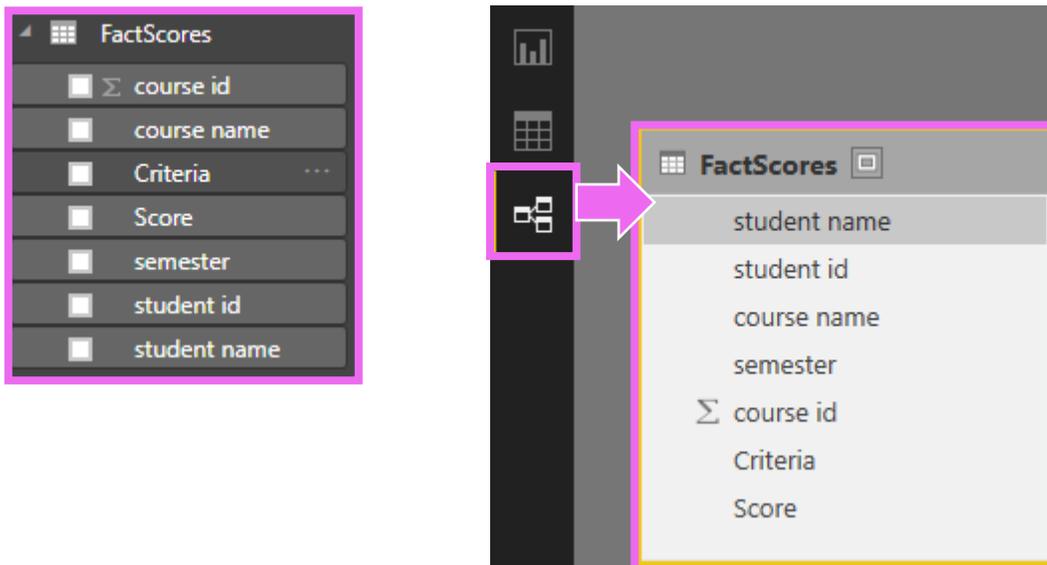
Change the data type of the **Score** column to **Whole Number**. Click on the icon next to the column header, then select **Whole Number**.



3. Click **Close & Apply** to load the Fact Table to the data model



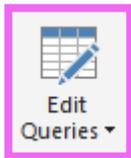
FactScores will show up in the **Fields** pane. Click the icon to view the FactScores table in the **Relationships** view.



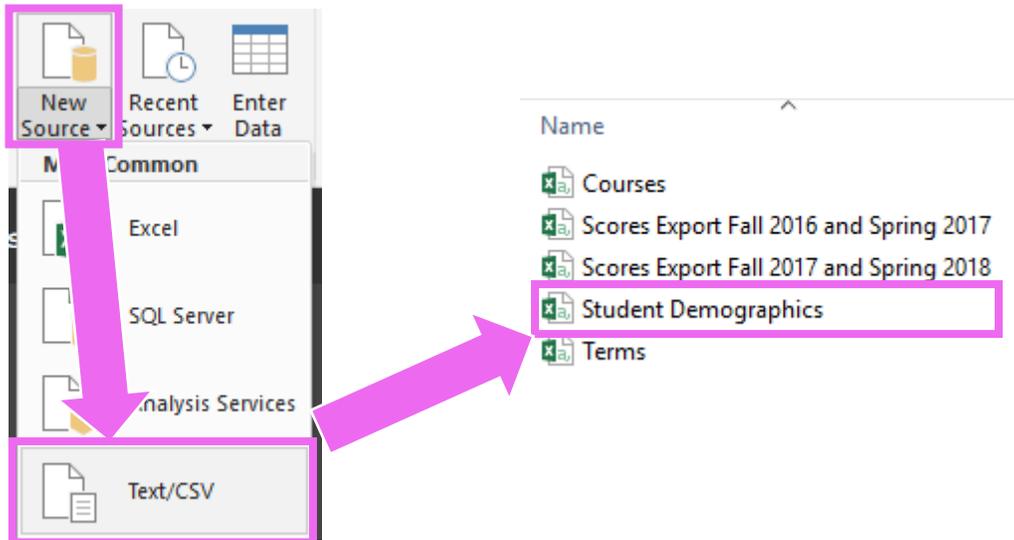
Build the Dimension Tables

1. Connect to additional source files.

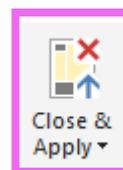
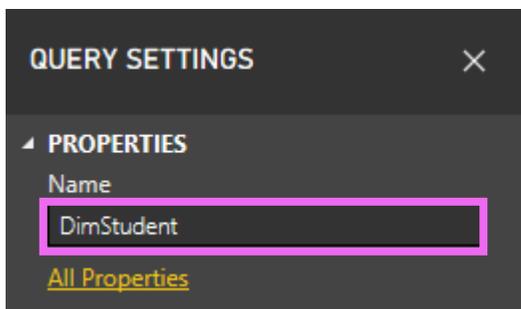
Click **Edit Queries** to return to the query editor.



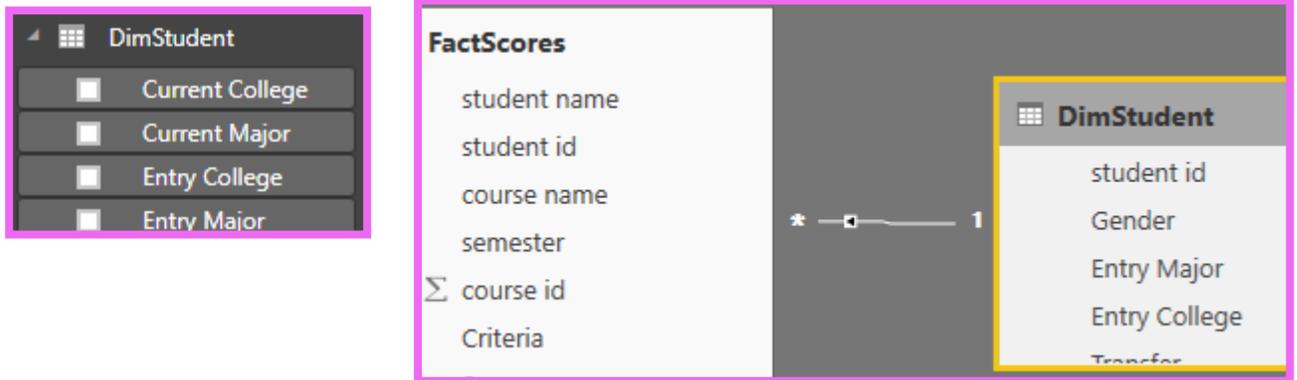
Click **New Source**, then select **text/csv** file and connect to the **Student Demographics** source file.



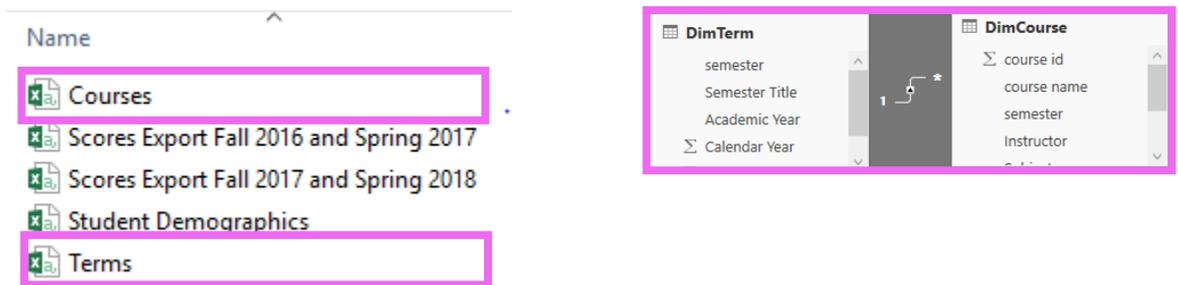
Rename the query to **DimStudent** and click **Close and Apply**.



DimStudent will show up in the **Fields** pane and will connect to the **FactScores** table in the **Relationships** view.



Repeat these steps to create **DimCourse** and **DimTerm** from the **Courses** and **Terms** source files.



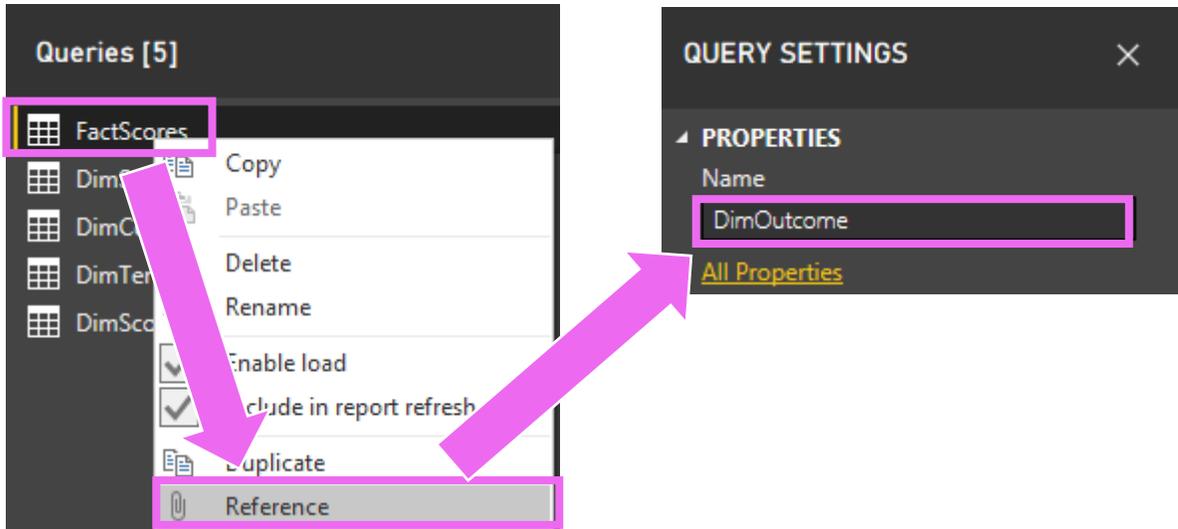
2. Create a table to define achievement levels associated with scores in **FactScores**. Click **Enter Data** and type in the following to create **DimScore**.

The diagram shows a pink arrow pointing from the 'Enter Data' button to a text box labeled 'Name: DimScore'. Below this, another pink arrow points to a table with the following data:

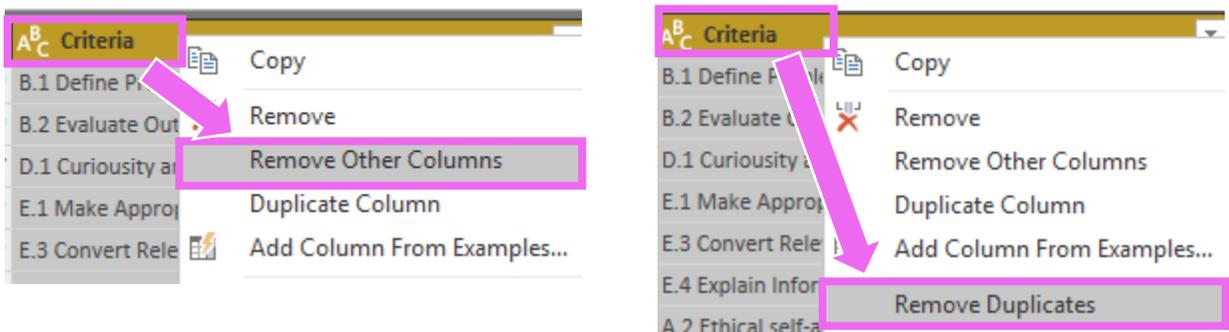
	Score	Score Text	Proficient Status	*
1	1	Does Not Meet Expectations	Not Proficient	
2	2	Meets Minimum Expectations	Not Proficient	
3	3	Meets Expectations	Proficient	
4	4	Exceeds Expectations	Proficient	
*				

3. Extract the list of outcomes.

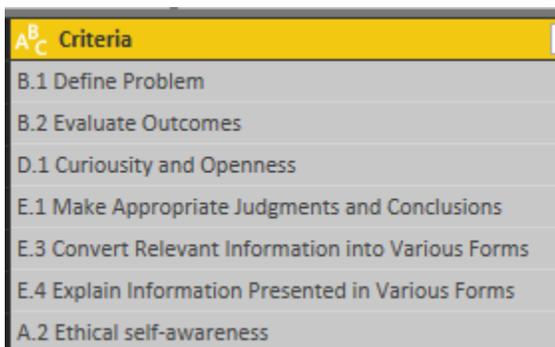
Right-Click FactScores & click Reference. Rename the new table to **DimOutcome**.



In DimOutcome, **right-click** the **Criteria** column to bring up the menu and choose **Remove other columns**. Right-click **Criteria** again and choose **Remove Duplicates**.

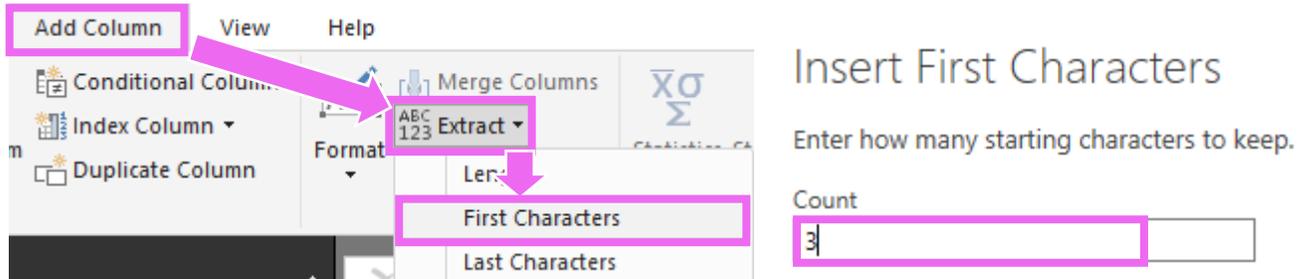


The table will now contain a single, unduplicated column of criteria.



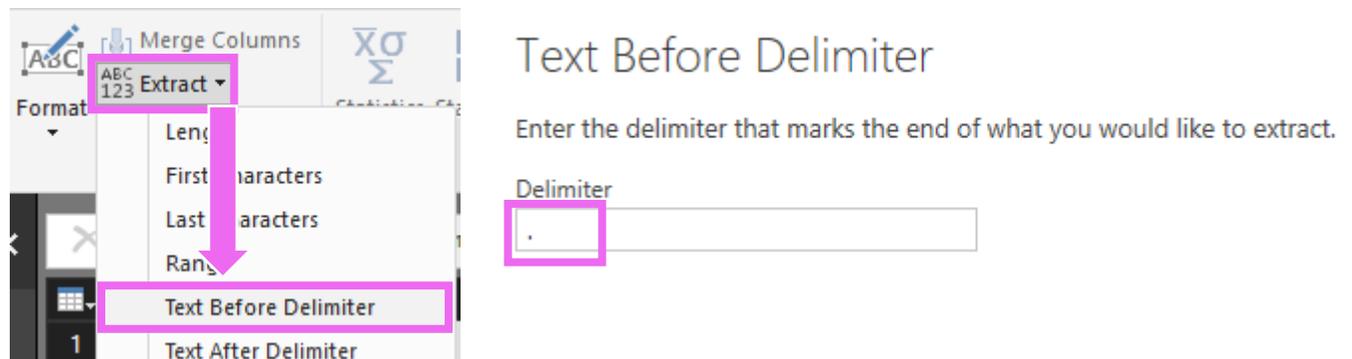
4. Create Additional Fields

Select the **Criteria** column. In the **Add Column** tab, click **Extract**, then **First Characters**. Extract the **first 3 characters** and rename the resulting column to **Code**.



Criteria	Code
B.1 Define Problem	B.1
B.2 Evaluate Outcomes	B.2
D.1 Curiosity and Openness	D.1

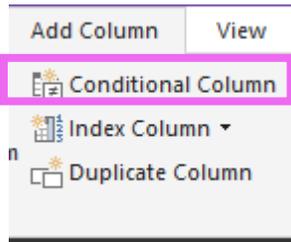
Select the **Criteria Column**. In the **Add Column** tab, click **Extract**, then **Text Before Delimiter**. Enter a period (".") as the delimiter and click OK.



Rename the resulting column to **Outcome Letter**.

Criteria	Code	Outcome Letter
B.1 Define Problem	B.1	B
B.2 Evaluate Outcomes	B.2	B
D.1 Curiosity and Openness	D.1	D

Click the **Outcome Letter** column to select it. In the **Add Column tab**, click **Conditional Column**.



Enter **Outcome Text** as the new column name. Then enter the fields as they appear below.

New column name
Outcome Text

	Column Name	Operator	Value		Output
If	Outcome Letter	equals	A	Then	Critical Thinking
Else If	Outcome Letter	equals	B	Then	Written Communication
Else If	Outcome Letter	equals	C	Then	Creative Thinking
Else If	Outcome Letter	equals	D	Then	Intercultural Knowledge
Else If	Outcome Letter	equals	E	Then	Quantitative Reasoning

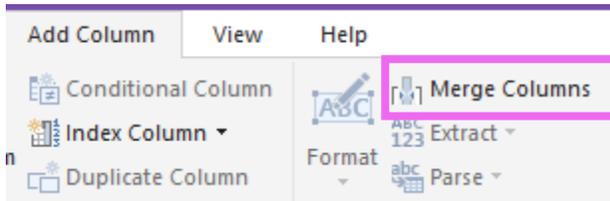
Add rule

Otherwise
Unknown

The **Outcome Text** column will appear in the table.

A _C ^B Criteria	A _C ^B Code	A _C ^B Outcome Letter	A _C ^B Outcome Text
B.1 Define Problem	B.1	B	Written Communication
B.2 Evaluate Outcomes	B.2	B	Written Communication
D.1 Curiosity and Openness	D.1	D	Intercultural Knowledge
E.1 Make Appropriate Judgments and Conclusions	E.1	E	Quantitative Reasoning

In the **Add Column** tab, click **Merge Columns**. Choose a **Custom Separator**, enter a **period (“.”)**, and type in **Full Outcome Text** as the new column name.



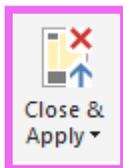
Merge Columns

Choose how to merge the selected columns.

Separator
 --Custom--
 . |
 New column name (optional)
 Full Outcome Text

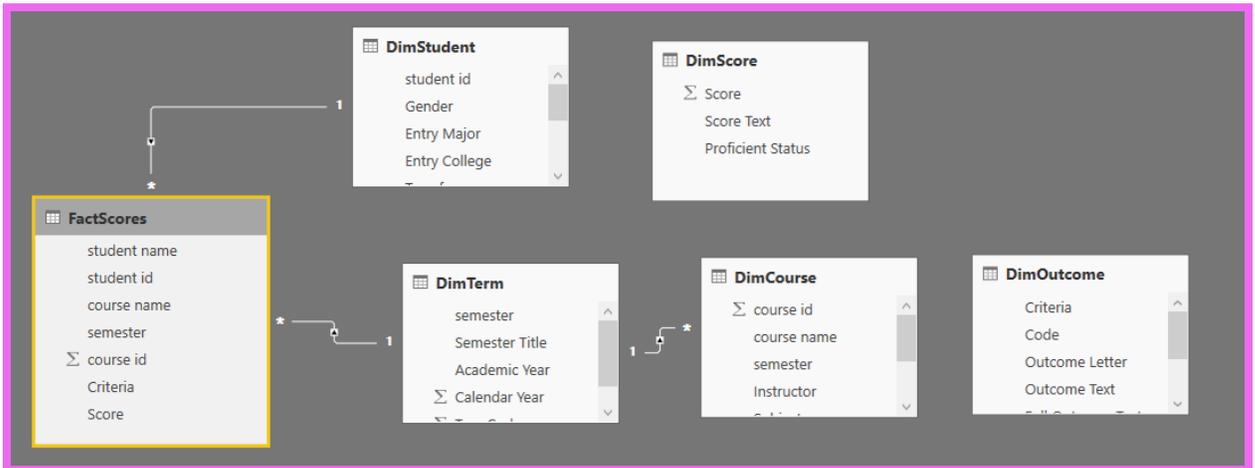
A ^B _C Criteria	A ^B _C Code	A ^B _C Outcome Letter	A ^B _C Outcome Text	A ^B _C Full Outcome Text
B.1 Define Problem	B.1	B	Written Communication	B. Written Communication
B.2 Evaluate Outcomes	B.2	B	Written Communication	B. Written Communication
D.1 Curiosity and Openness	D.1	D	Intercultural Knowledge	D. Intercultural Knowledge
E.1 Make Appropriate Judgments and Conclusions	E.1	E	Quantitative Reasoning	E. Quantitative Reasoning
E.3 Convert Relevant Information into Various Forms	E.3	E	Quantitative Reasoning	E. Quantitative Reasoning
E.4 Explain Information Presented in Various Forms	E.4	E	Quantitative Reasoning	E. Quantitative Reasoning

5. In the **Home Tab**, Click **Close & Apply** to load the Dimensions to the Data Model

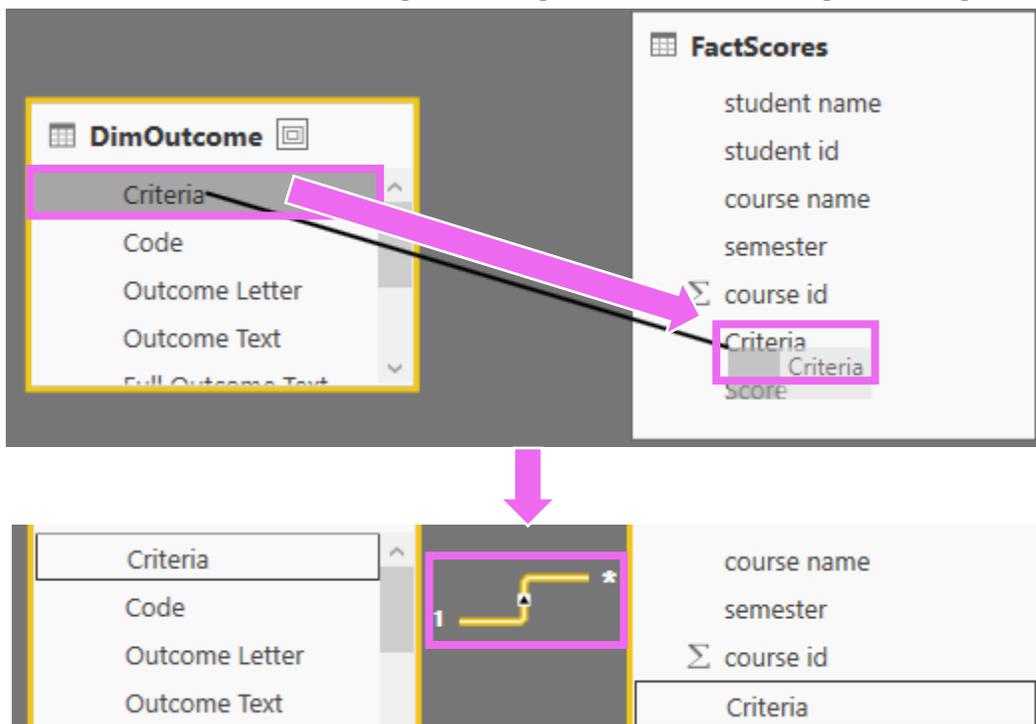


Confirm Data Model Relationships and Create Additional Key Fields

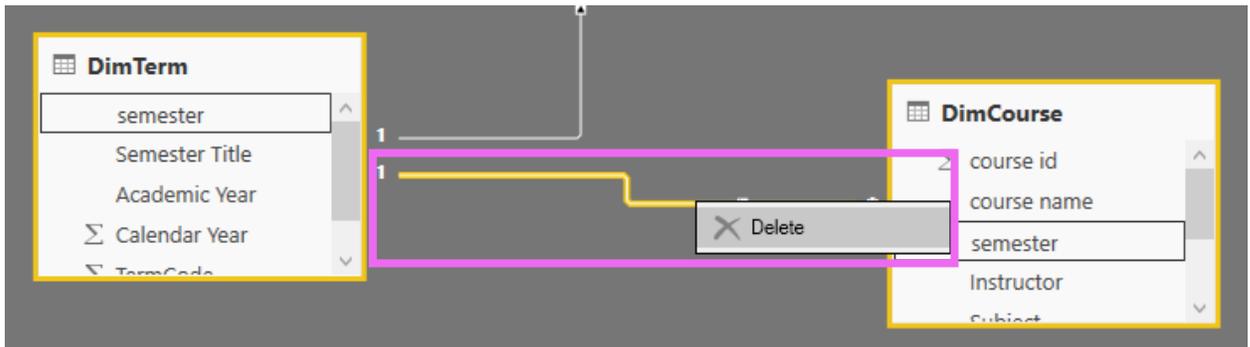
1. **Check that the Correct Fields are Connected.** Switch to the **Relationships view**. Note the tables are not arranged in a star schema. Move tables by clicking and dragging the table names.



Click and drag from one field to another to create a relationship between DimOutcome[Criteria] and FactScores[Criteria].



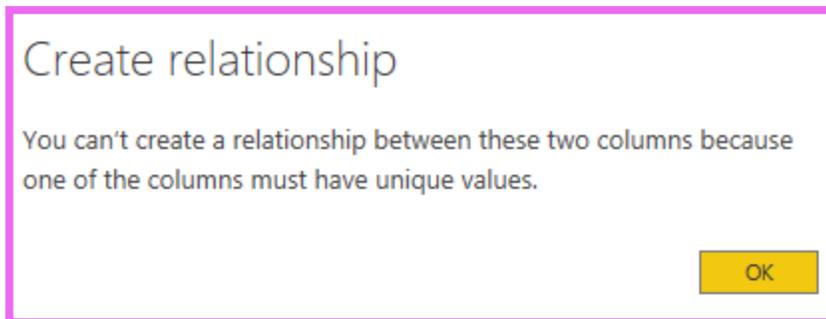
Right-click on a relationship to delete it. Do this for the relationship between DimTerm and DimCourse.



Double-click on a relationship edit it. You can also use the **Manage Relationships** button to edit and create new relationships.



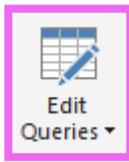
Relationships must include a unique set (unduplicated) values on at least one side of the relationship. They must be one-to-one or one-to-many. Try to **create a relationship between FactScores[CourseID] and DimCourse[CourseID]**. You should receive an error.



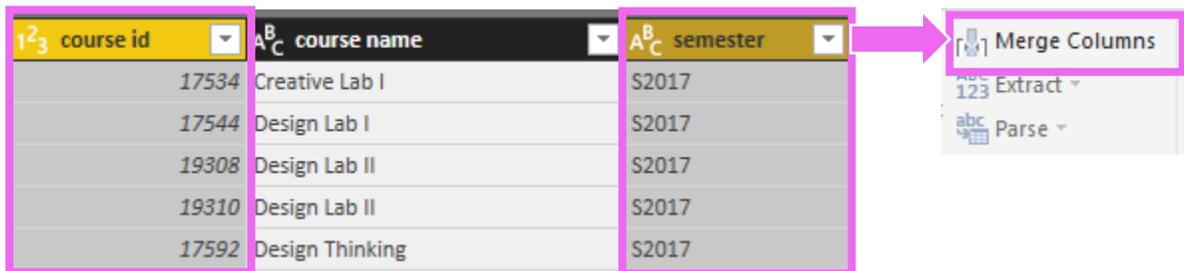
This happens because CourseIDs are reused and there are multiple courses with the same ID. We will create a new key field that combines CourseID and Term in order to connect these tables.

2. Create a new key field.

Click **Edit Queries** to return to the query editor.

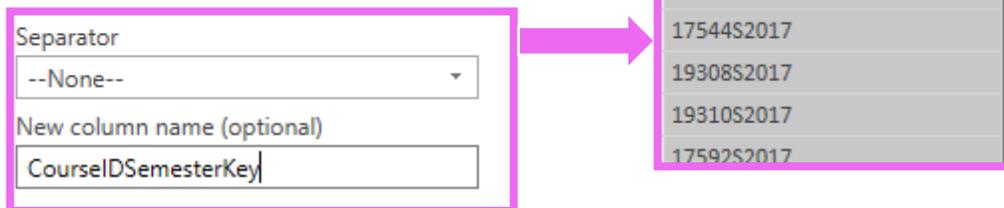


In **DimCourse**, hold **Ctrl** and select **course id** then **semester**. Then click **Merge Columns** in the **Add Column** tab.



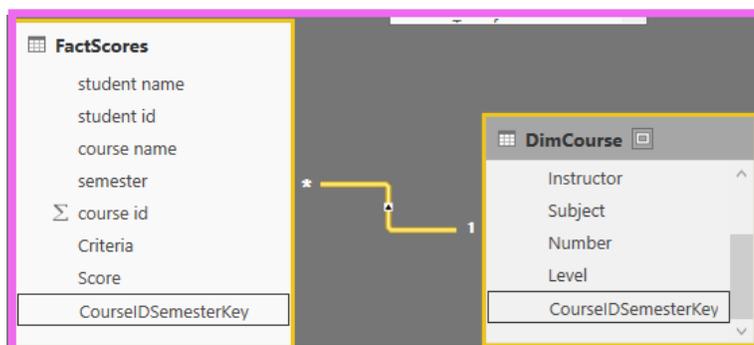
Merge Columns

Choose how to merge the selected columns.

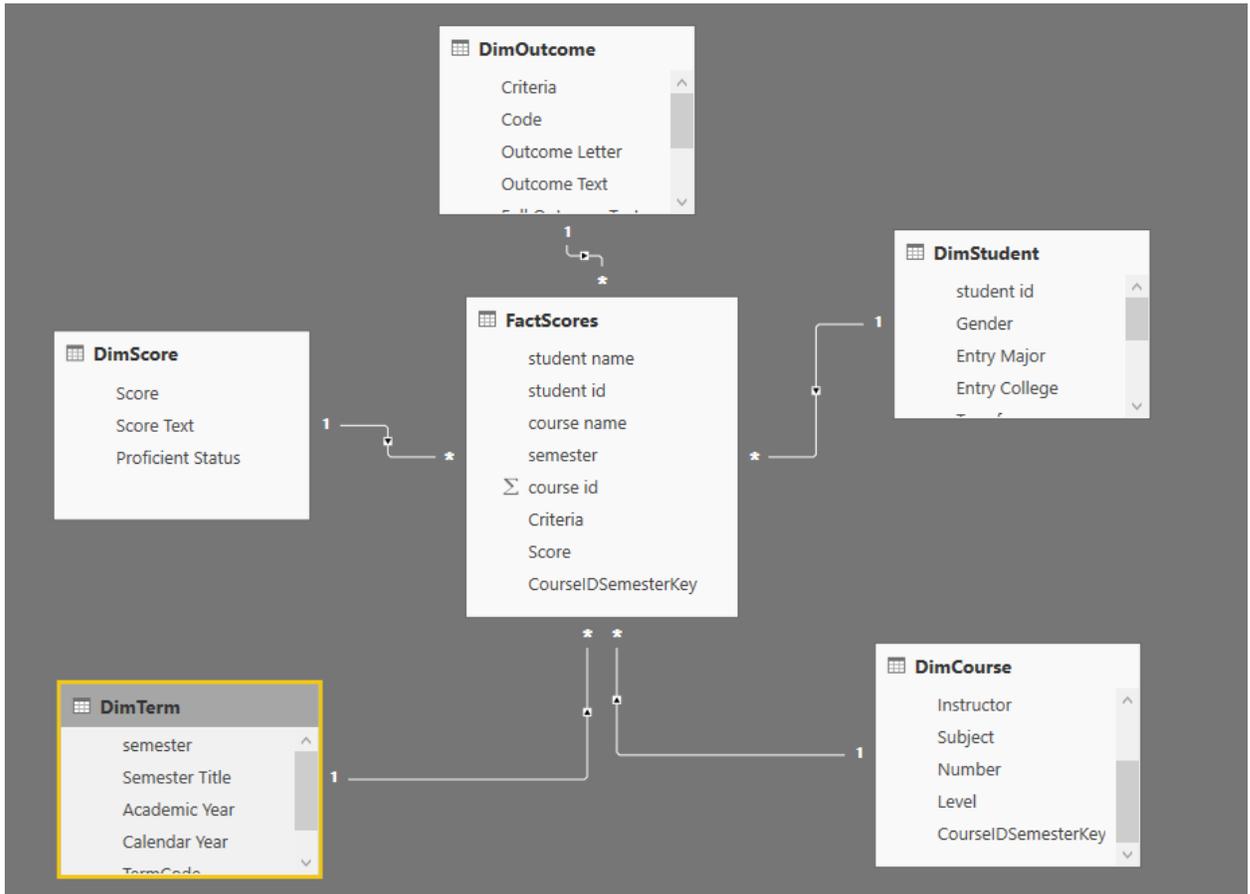


Repeat these steps in FactScores to create the **CourseIDSemesterKey** field in that table. Then click **Close & Apply**.

Use the new key fields to create a relationship between **FactScores** and **DimCourse**.



The assessment dashboard data model is now complete and shows up as a star schema.

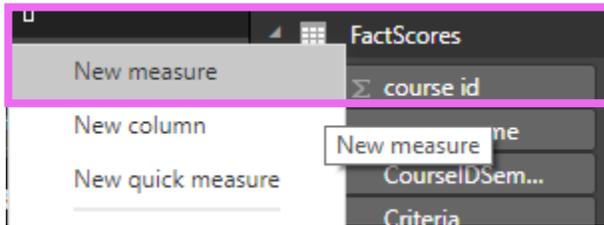


Part II: Create the Report

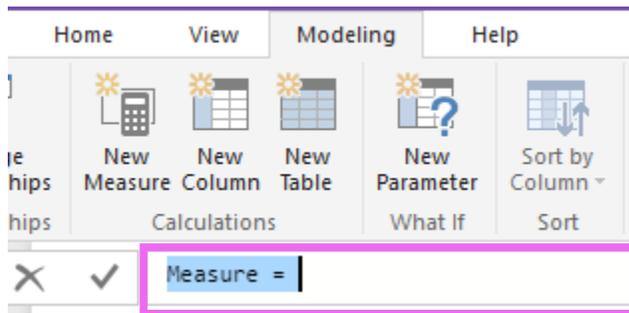
Write DAX Measures to perform calculations and aggregate data.

1. Create Count Scores Measure.

Right-click on FactScores and click New Measure.



The **Measure editor** appears at the top of the screen.



Enter the following in the box to create count scores. Then hit the Enter key.

```
Count Scores = count(FactScores[Score])
```

Repeat the previous steps to create the **Count All Scores** measure. Note that this measure references **Count Scores**.

```
Count All Scores = CALCULATE([Count Scores],ALL(DimScore))
```

Create additional measures:

%Scores – Divides count scores and count all scores

```
% Scores = [Count Scores] / [Count All Scores]
```

Count Students – Uses DISTINCTCOUNT to count individual students

```
Count Students = DISTINCTCOUNT(FactScores[student id])
```

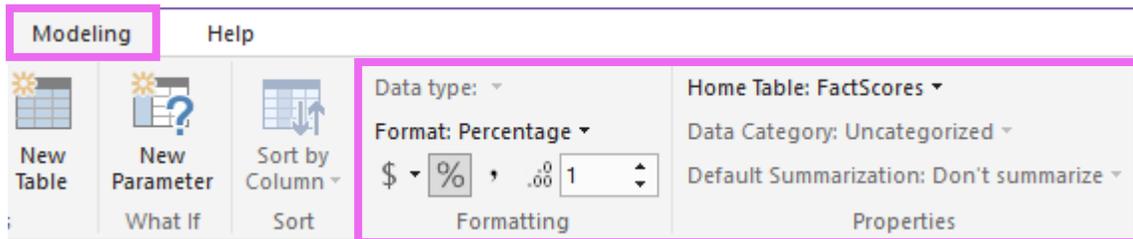
Count ALL Students – Total number of assessed students

```
Count All Students = CALCULATE([Count Students],ALL(DimStudent))
```

%Students – Use in charts that show % of students by demographics

```
% Students = [Count Students] / [Count All Students]
```

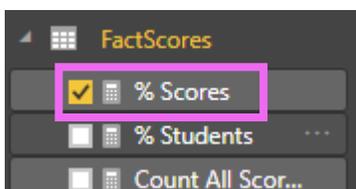
After creating each measure, click on the measure and set it to the correct options in the **Modeling tab**. For example, **%Scores** should be set as a **Percentage** data type with 1 decimal place. Its home table should be FactScores.



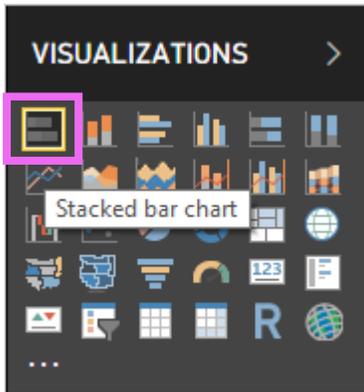
Create the Visualizations

1. Create Score Breakdown Chart

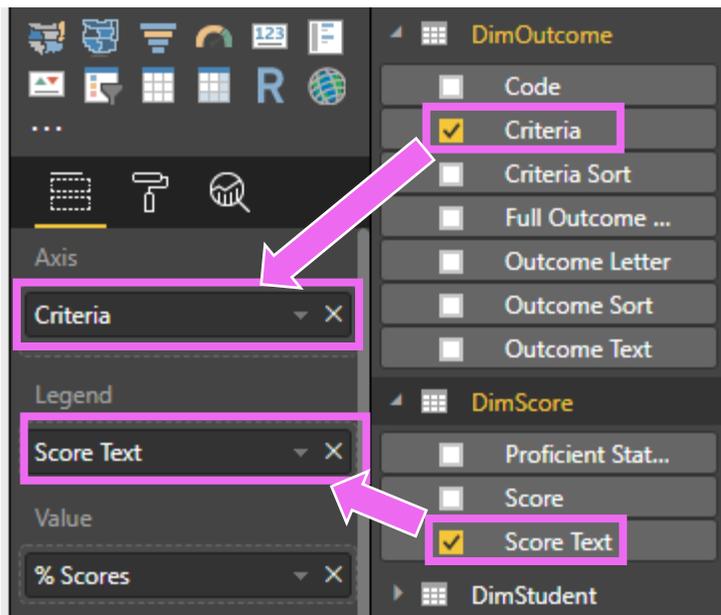
Under **FactScores** in the **Fields Pane**, check the box for **%Scores**.



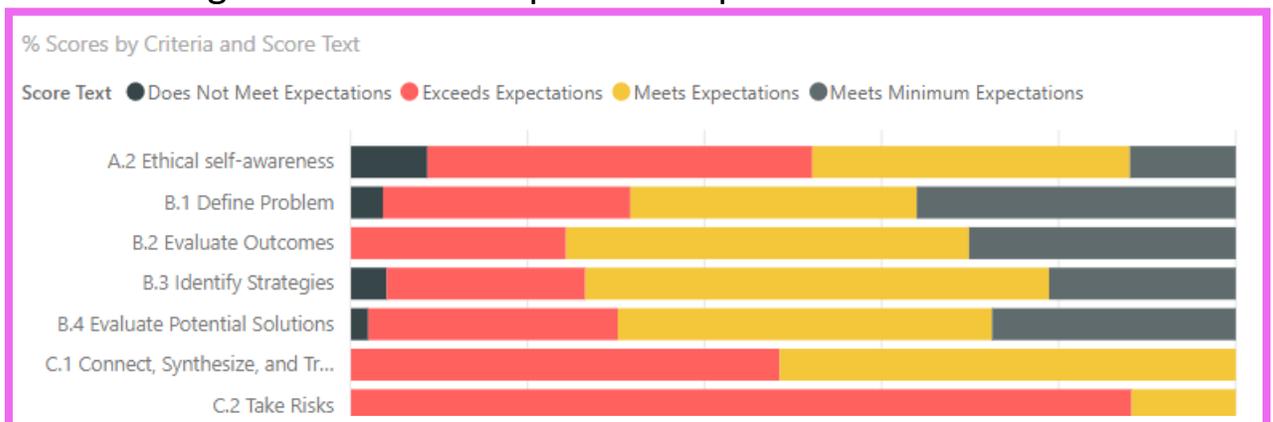
In **Visualizations**, click to change the visual to a **Stacked bar chart**.



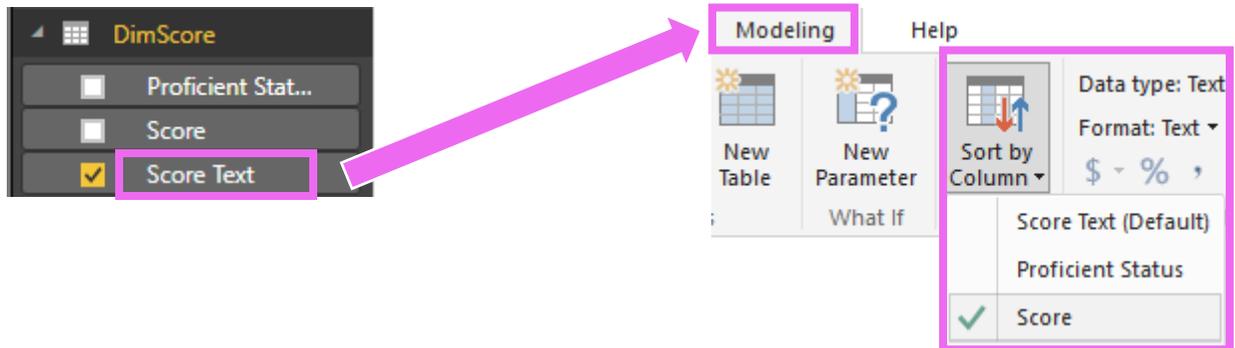
Add the **Criteria** and **Score Text** fields to the visual by dragging and dropping them into the field wells.



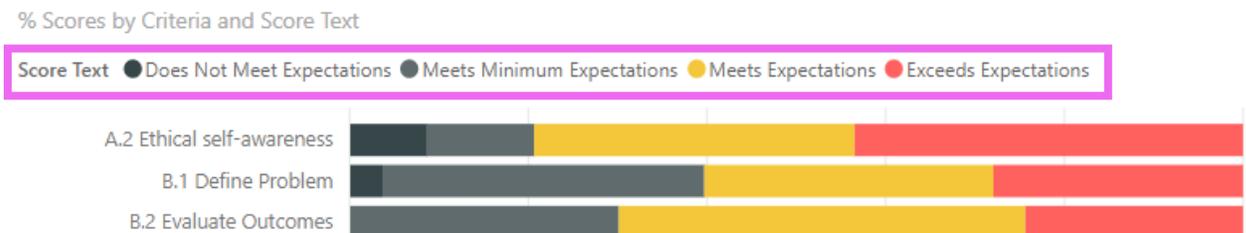
The resulting chart will show up on the report canvas.



To override the alphabetical sort order of the legend, click on **Score Text** in the **Fields** pane. In the **Modeling** tab, set the **Sort by Column** to **Score**.



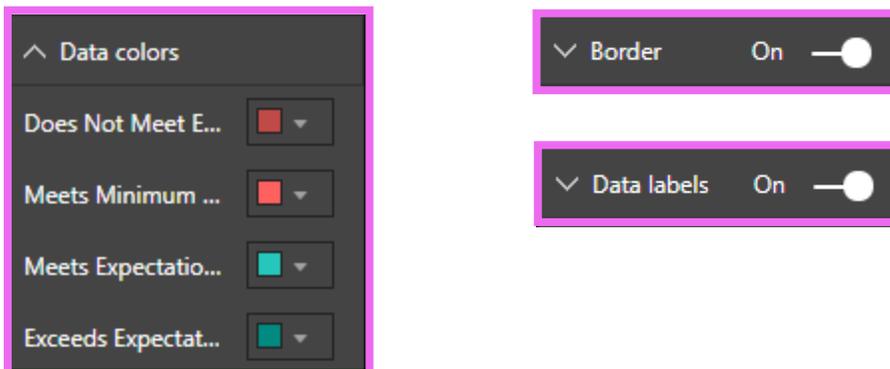
The legend will now be sorted by the score value instead of alphabetically.



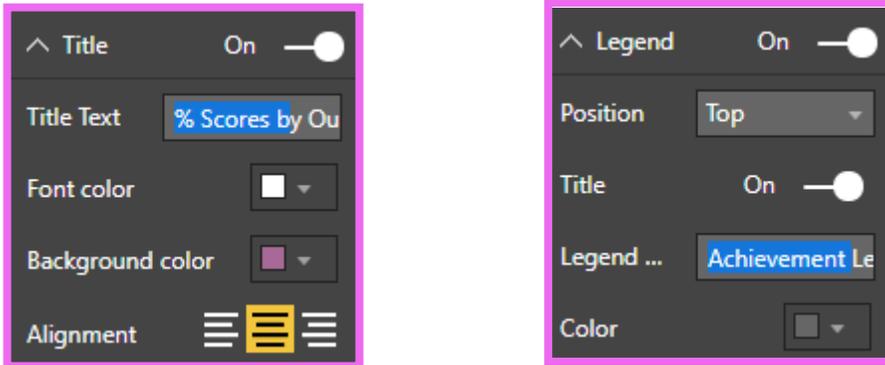
Set the **Formatting Options** for the chart using the **Formatting Pane**.



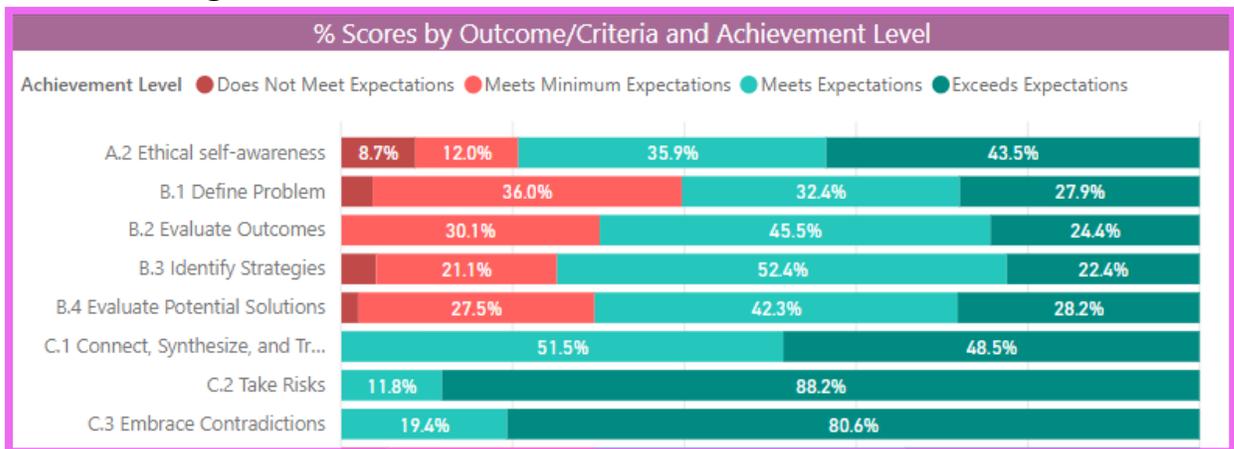
Change the data colors and turn the border and data labels on.



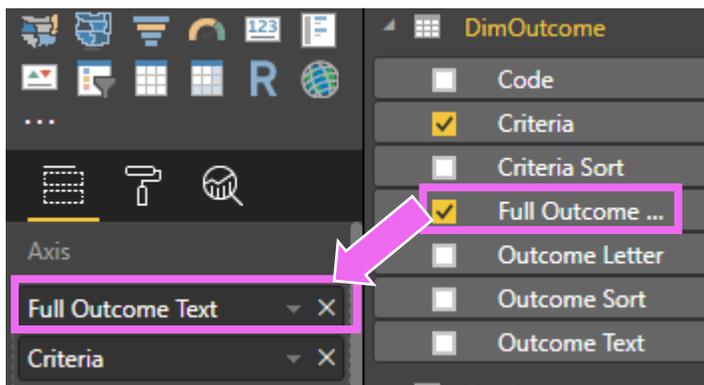
Change the title and legend text and format them.



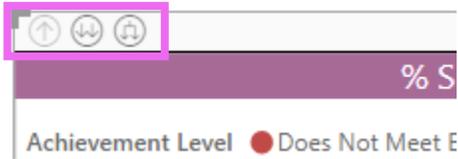
The resulting chart will look like this:



Add **Full Outcome Text** above **Criteria** in the **Axis** field well to enable drilling up and down between levels.



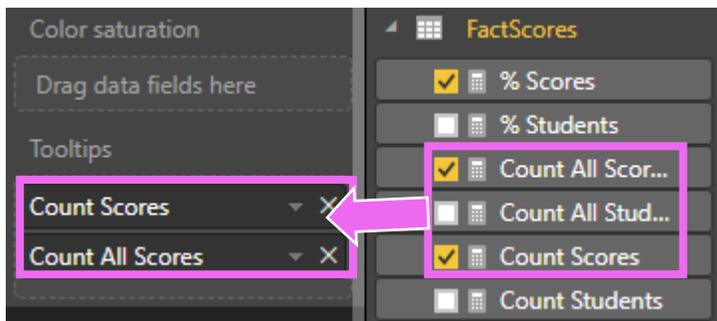
The **drill buttons** now appear at the top of the visual.



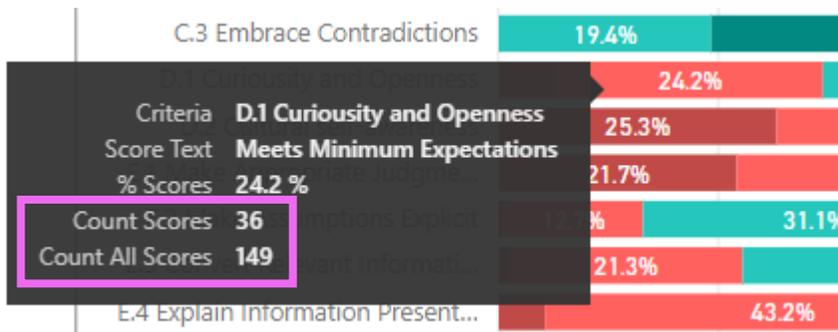
Drilling up and down displays data by criteria or outcome.



Add **Count Scores** and **Count All Scores** to the **Tooltips** field well.

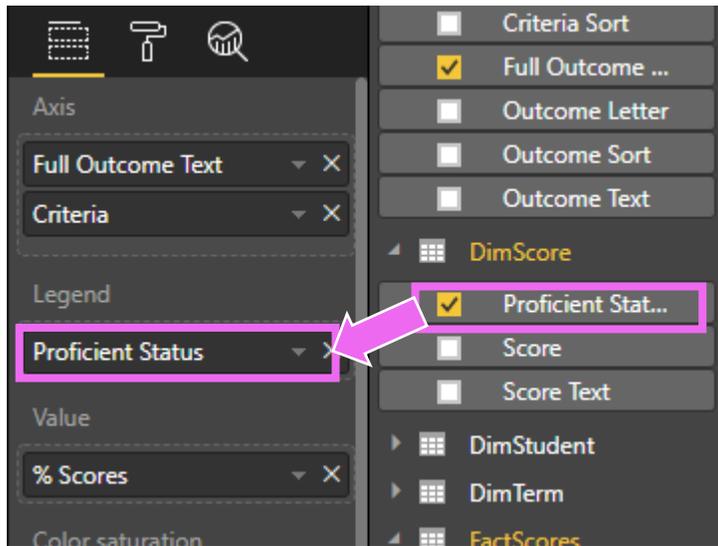


Count Scores and **Count All Scores** will now appear in the tooltip when mousing over the visual.

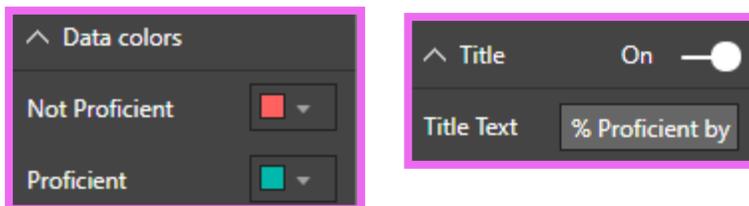


2. Create Proficiency Rank Chart

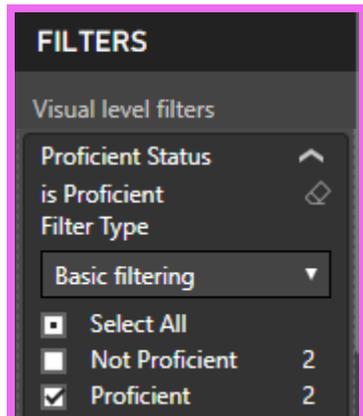
Click on the %Scores visual. Use **Ctrl+C** and **Ctrl+V** to copy and paste the visual on the canvas. In the new visual, replace **Score Text** with **Proficient Status** in the Legend field well.



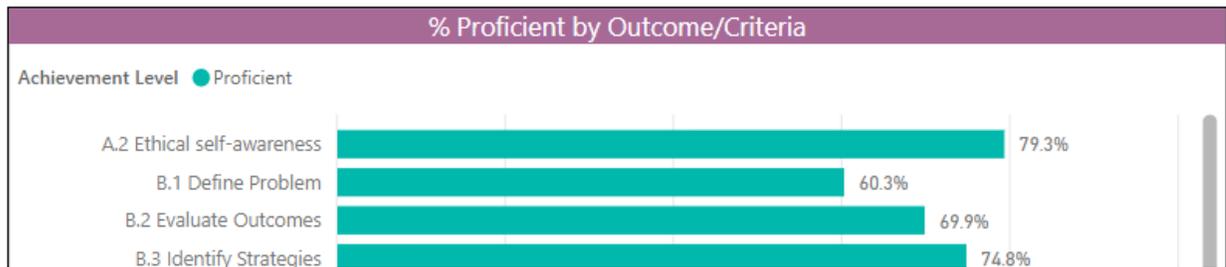
Use the **Formatting Pane** to change the **Data colors** and **Title**.



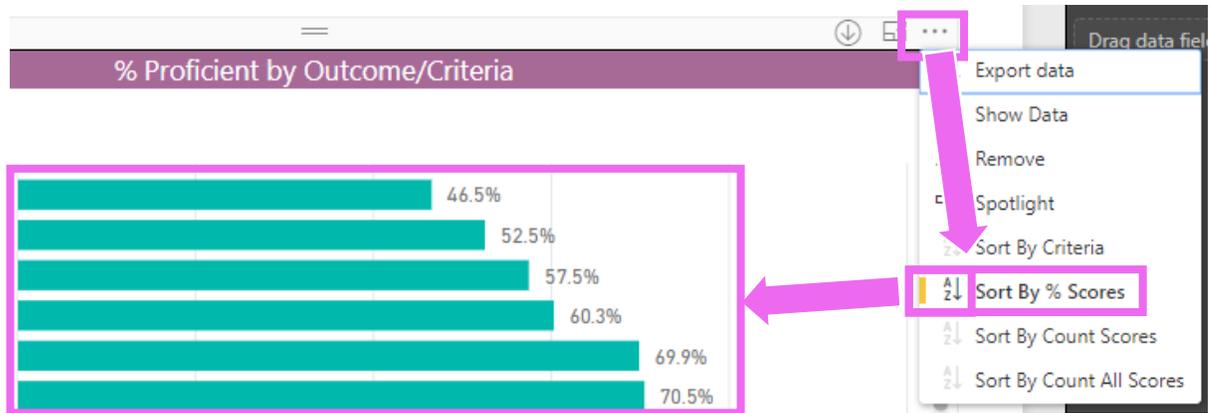
In the **Filters Pane**, uncheck **Not Proficient** under the **Proficient Status** visual level filter. This will cause the visual to show only Proficient scores.



The resulting visual will look like this:

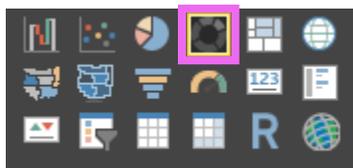


Select the visual and click the **Ellipsis (...)** icon. Then choose to sort by %Scores to sort lowest to highest. You may need to click the **AZ** icon next to Sort By to sort the correct direction.

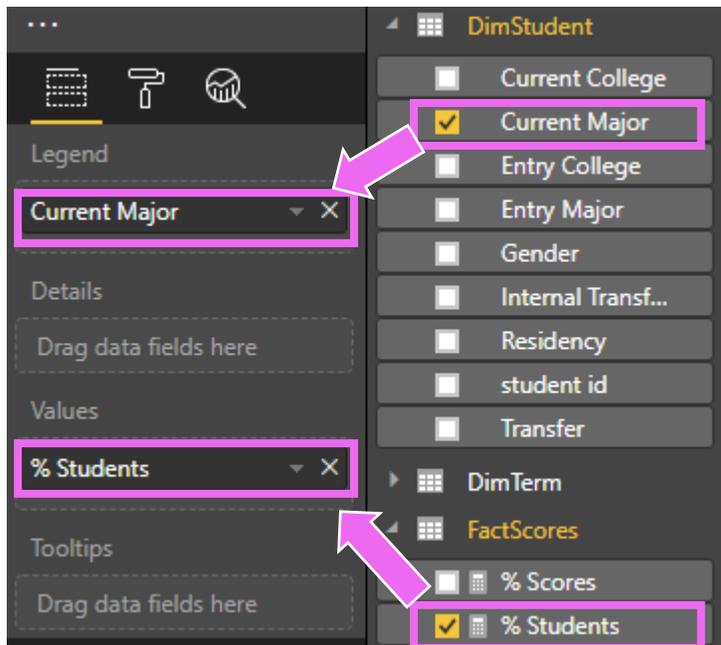


3. Create Demographic Charts

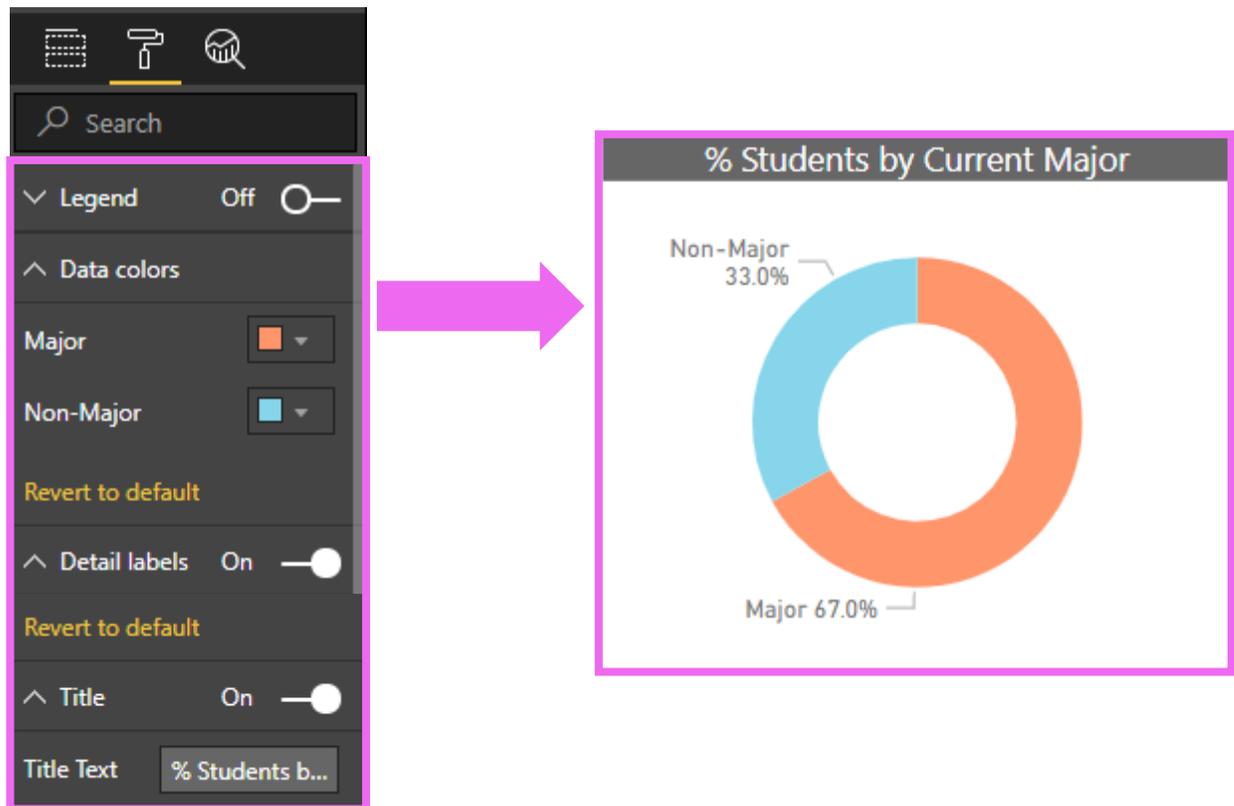
Click a blank spot on the canvas so that no chart is selected. Then click the **Donut Chart** icon from the visualizations pane.



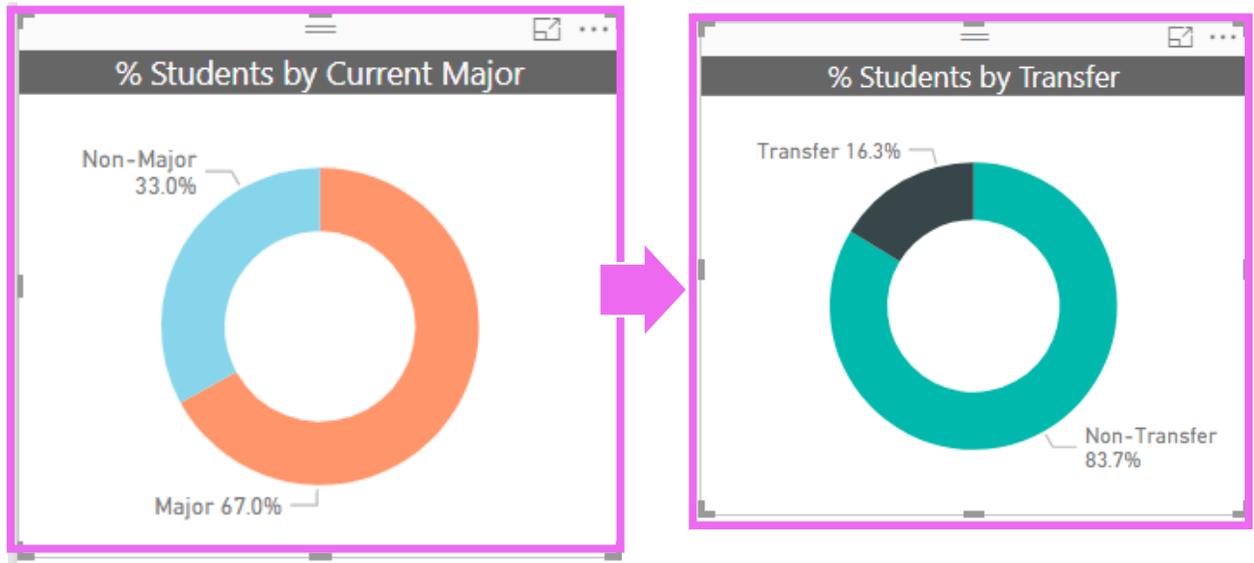
Add **Current Major** and **% Students** to the chart.



Change the **Formatting Options** and view the new chart.

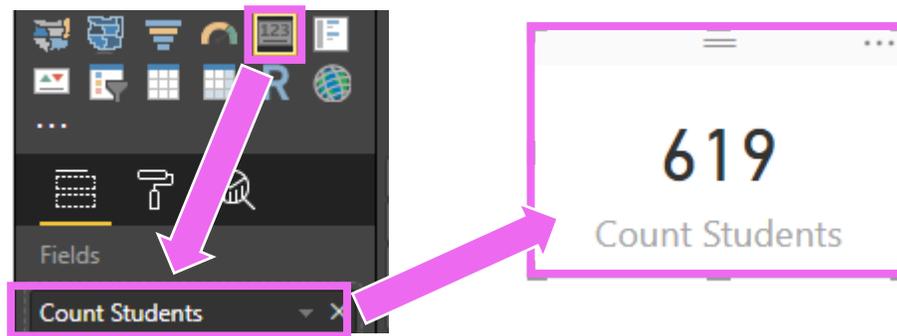


Copy and paste the student chart. **Replace Current Major** with **Transfer** in the **Legend** field well.



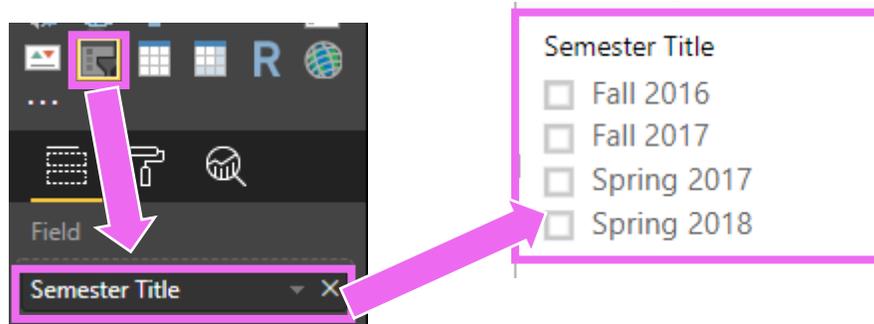
Set the **Formatting Options** for the **Transfer Chart**.

Add **Count Students** as a **Card** visual.



4. Create Slicers

Add **Semester Title** as a slicer visual. Slicers are interactive and allow users to filter the data on the page.



Use the slicer menu to switch between options. Display the semester slicer as a **Dropdown**.



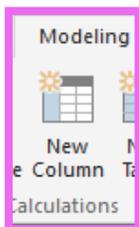
Some slicers work better when data is grouped. For example, displaying every course may not be useful, but looking at <400 level courses and >400 level courses could provide some indication of differences between formative and summative assessments.

Create groups using a calculated column. In the data view, click the **DimCourse** table.

A screenshot of the Power BI data view showing a table with the following columns: course id, course name, semester, Instructor, Subject, Number, and CourseIDSemesterKey. The first two rows of data are visible.

course id	course name	semester	Instructor	Subject	Number	CourseIDSemesterKey
17534	Creative Lab I	S2017	Jane Velazquez	ASMT	450	17534S2017
17544	Design Lab I	S2017	Miriam Costa	ASMT	510	17544S2017

In the **Modeling** tab, click **New Column**.



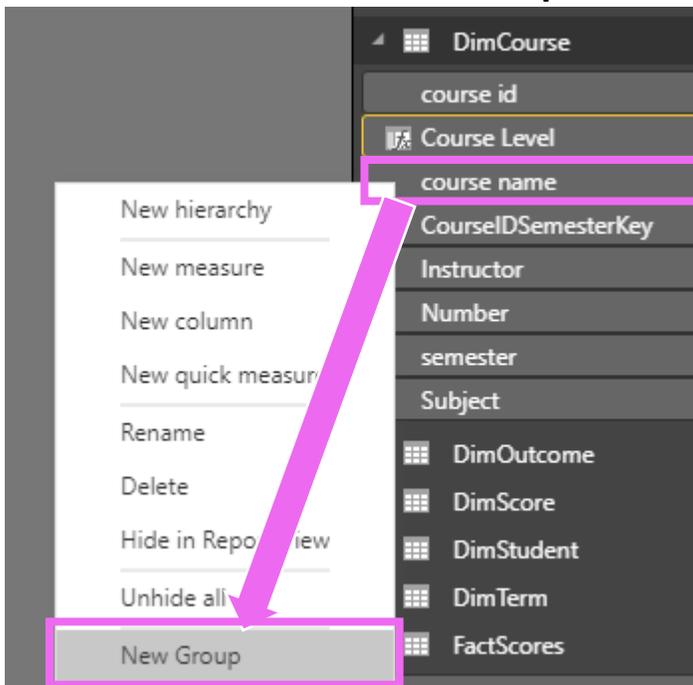
Enter the following formula to check create a new column that shows whether a course is <400 (lower level) or 400+ (upper level).

```
Course Level = if(DimCourse[Number]<400, "<400", "400+")
```

The new column will appear. In the report view, **add this column as a slicer.**

course name	semester	Instructor	Subject	Number	CourseIDSemesterKey	Course Level
Creative Lab I	S2017	Jane Velazquez	ASMT	450	17534S2017	400+
Design Lab I	S2017	Miriam Costa	ASMT	510	17544S2017	400+
Design Lab II	S2017	Miriam Costa	ASMT	520	19308S2017	400+
Design Lab II	S2017	Andy Traeger	ASMT	520	19310S2017	400+
Design Thinking	S2017	Ann Perkins	ASMT	200	17592S2017	<400

Groups can also be created using the **Groups** option. To create groups of lab and non-lab courses, **right-click** on **Course Name** in **DimCourse** and click **New Group**.



Create groups by selecting the courses you want to group and then clicking **Group**. Rename the groups by double-clicking the group name. Then click **OK**.

Groups

Name: Field:

Group type:

Ungrouped values

- Creative Lab I
- Design Lab I
- Design Lab II
- Design Thinki
- Engineering Design Principles
- Ethical Communication
- Introduction to Design Thinking
- Measurement
- Statistics for Design
- Writing across Culture

Groups and members

- Creative Lab I
 - Design Lab I
 - Design Lab II
- Design Thinking
 - Engineering Design Principles
 - Ethical Communication
 - Introduction to Design Thinking
 - Measurement

Include Other group ⓘ

The **group** will appear as a new column in the table.

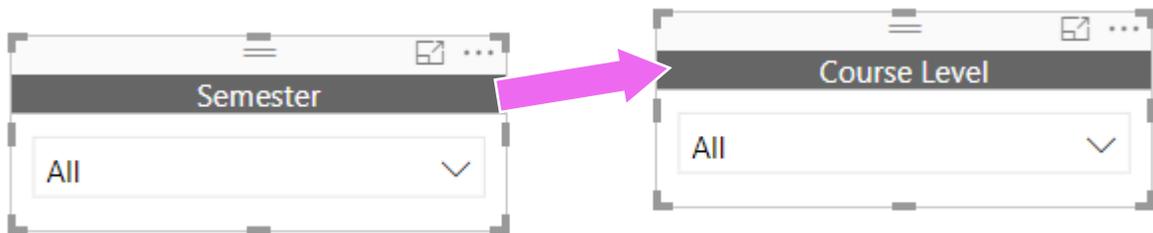
course id	course name	semester	Instructor	Subject	Number	CourseIDSemesterKey	Course Level	Course Groups
17534	Creative Lab I	S2017	Jane Velazquez	ASMT	450	17534S2017	400+	Labs
17544	Design Lab I	S2017	Miriam Costa	ASMT	510	17544S2017	400+	Labs
19308	Design Lab II	S2017	Miriam Costa	ASMT	520	19308S2017	400+	Labs
19310	Design Lab II	S2017	Andy Traeger	ASMT	520	19310S2017	400+	Labs
17592	Design Thinking	S2017	Ann Perkins	ASMT	200	17592S2017	<400	Non-Labs
17539	Engineering Design Principles	S2017	Jane Velazquez	ASMT	210	17539S2017	<400	Non-Labs
17651	Ethical Communication	F2016	Jerry Ludgate	ASMT	230	17651F2016	<400	Non-Labs
18606	Introduction to Design Thinking	S2017	Leslie Gergich	ASMT	101	18606S2017	<400	Non-Labs
17542	Measurement	F2016	Ron Goodman	ASMT	400	17542F2016	400+	Non-Labs

Create a slicer from the new group. Copy and paste another slicer to carry over its formatting options.

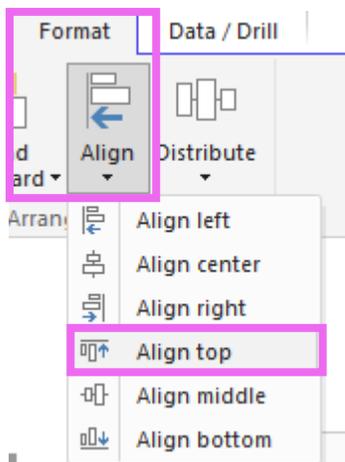
Course Type

All

5. **Align and Distribute Elements.** As elements are added to the canvas, they may not be aligned appropriately. These two slicers should be even top to bottom. Instead of aligning these manually, use the built in formatting tools.



Select the elements you want to align by holding **Ctrl** while clicking each element. In the **Format** tab, click **Align**, then choose an alignment.



The slicers will now be aligned to the top.

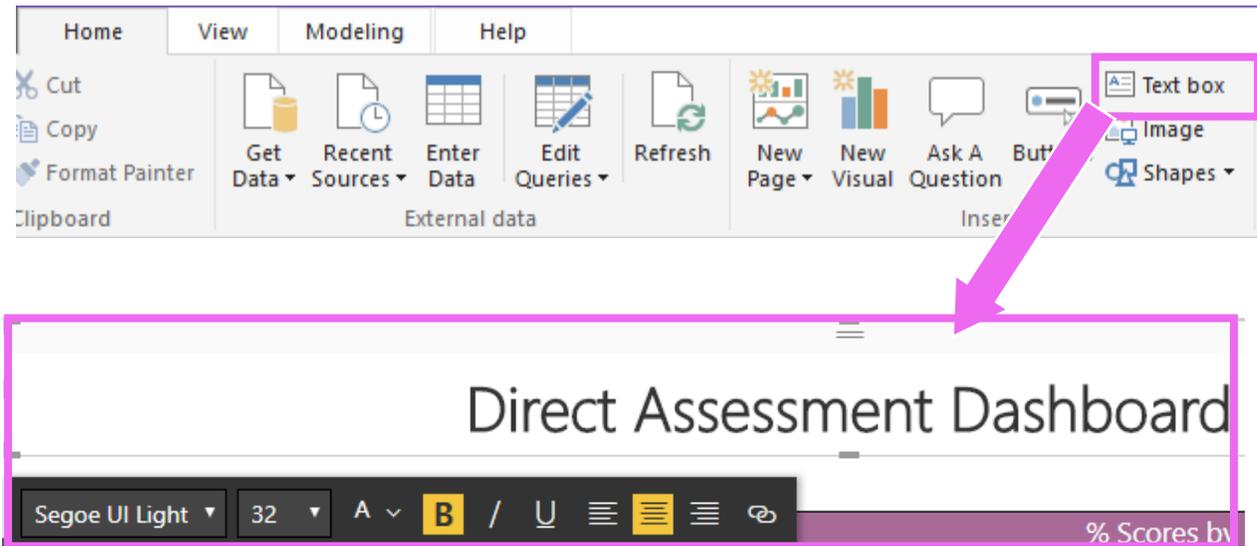


Use the **Distribute** tool to create even space in between three or more selected visuals, either vertically or horizontally.



Format the Report

1. **Add a Title.** On the home tab, click **Text box**. Then type the title in the box and change the text format.



2. **Add a wordmark.**

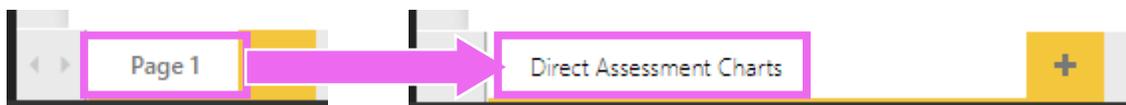
Click **Image**. Then select the image file. Resize the image and place it in the correct location.



Create a Page with Tables

1. **Rename the Page and Duplicate it.**

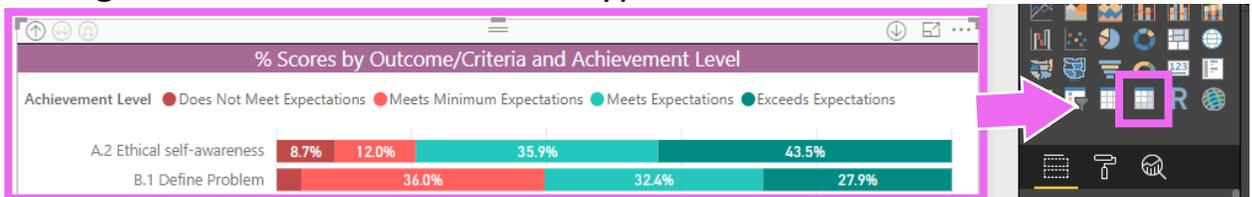
Double-click the **page tab** and type in a new name.



Right-click on the page tab and click **Duplicate Page**. Rename the new page **Tables**.



- Delete the proficiency chart by clicking on it and hitting the Delete key. Click on the score breakdown chart to select it. Change it to a Table visualization type.**



Change formatting options and fields as necessary to make the table look presentable. The final table will look something like this:

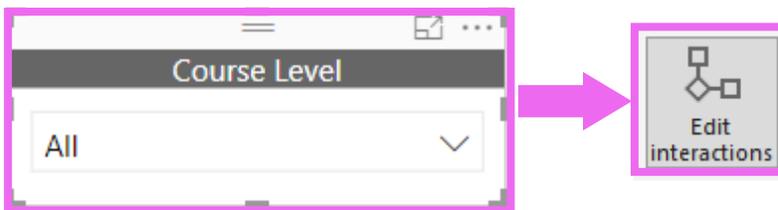
% Scores by Outcome/Criteria and Achievement Level				
Full Outcome Text	Does Not Meet Expectations	Meets Minimum Expectations	Meets Expectations	Exceeds Expectations
A. Critical Thinking	8.7 %	12.0 %	35.9 %	43.5 %
A.2 Ethical self-awareness	8.7 %	12.0 %	35.9 %	43.5 %
B. Written Communication	2.4 %	28.6 %	43.4 %	25.7 %
B.1 Define Problem	3.7 %	36.0 %	32.4 %	27.9 %
B.2 Evaluate Outcomes		30.1 %	45.5 %	24.4 %
B.3 Identify Strategies	4.1 %	21.1 %	52.4 %	22.4 %
B.4 Evaluate Potential Solutions	2.0 %	27.5 %	42.3 %	28.2 %
C. Creative Thinking			27.6 %	72.4 %
C.1 Connect, Synthesize, and Transform			51.5 %	48.5 %
C.2 Take Risks			11.8 %	88.2 %
C.3 Embrace Contradictions			19.4 %	80.6 %

Test and Finalize the Report

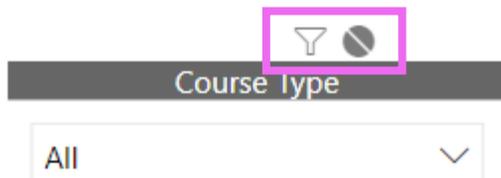
1. **Test the report.** Test your entire report before and after publishing and sharing to ensure it functions correctly and that viewers can easily understand and navigate.

Test and change how visuals interact with each other.

By default, clicking one visual will filter all other visuals on the page. To disable this, first select a visual. Then click the **Edit Interactions** option in the **Format Tab**.



Then use the icons at the top of another visual to change whether the interaction filters or does nothing to another visual.

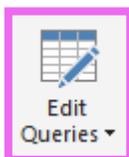


2. **Verify data confidentiality.** View the additional resources document on ensuring confidentiality in Power BI.

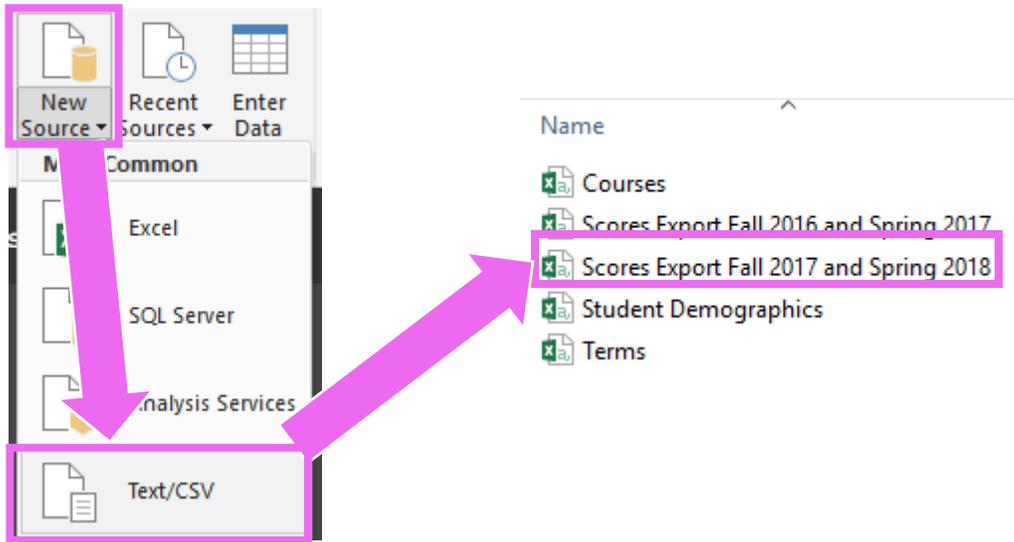
Update the report using new data

1. **Add the new data.**

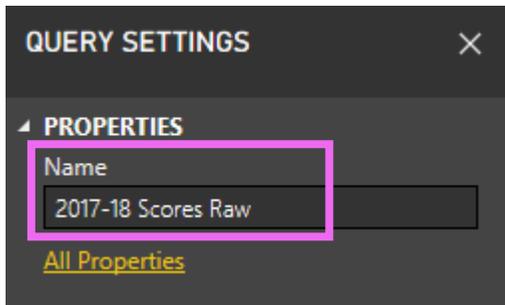
Click **Edit Queries** to return to the query editor.



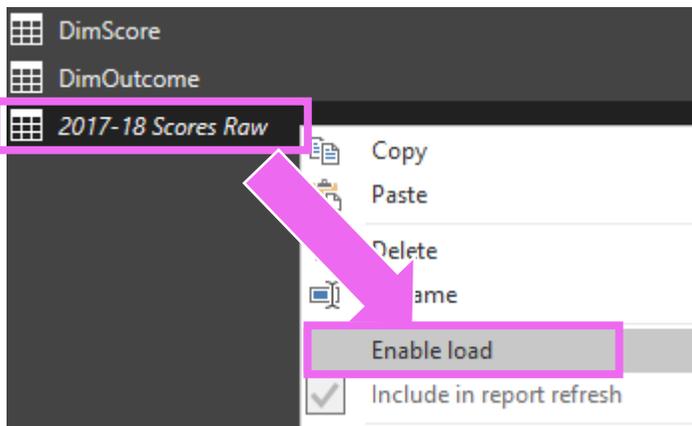
Click **New Source**, then select **text/csv** file and connect to the **Fall 2017 and Spring 2018 Scores Export**



Rename the query 2017-18 Scores Raw

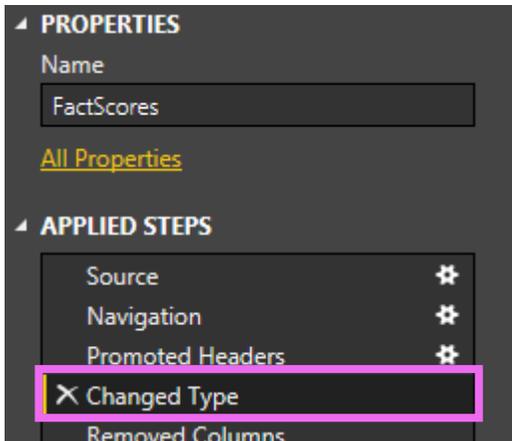


Right-click the query and unselect Enable Load. This will prevent this raw data from loading to the data model.

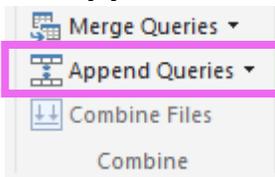


2. **Append the data to FactScores** so that all the existing transformations are applied.

Click FactScores. In the query steps, click the **Changed Type** step.



Click Append Queries. Appending adds another table as new rows.



Click Insert to clear the warning message.

Insert Step

Are you sure you want to insert a step? Inserting an intermediate step may affect subsequent steps, which could cause your query to break.

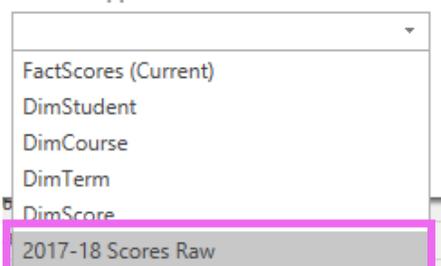


Select the 2017-18 Scores Raw Table and click OK.

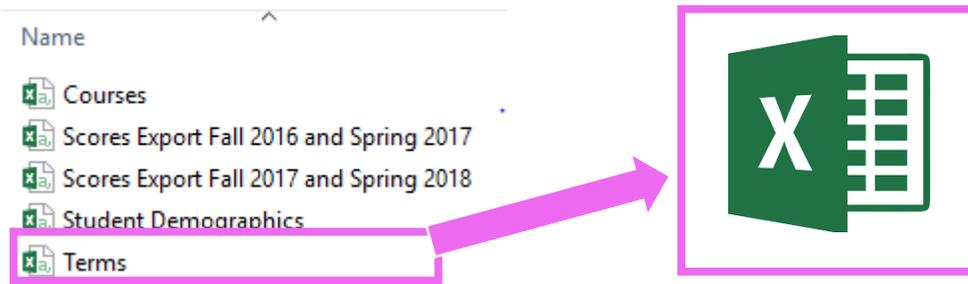
Append

Two tables Three or more tables

Table to append



- Update the Terms source file to add a new term. In the windows file explorer, navigate to the Terms source file and open it in Excel.

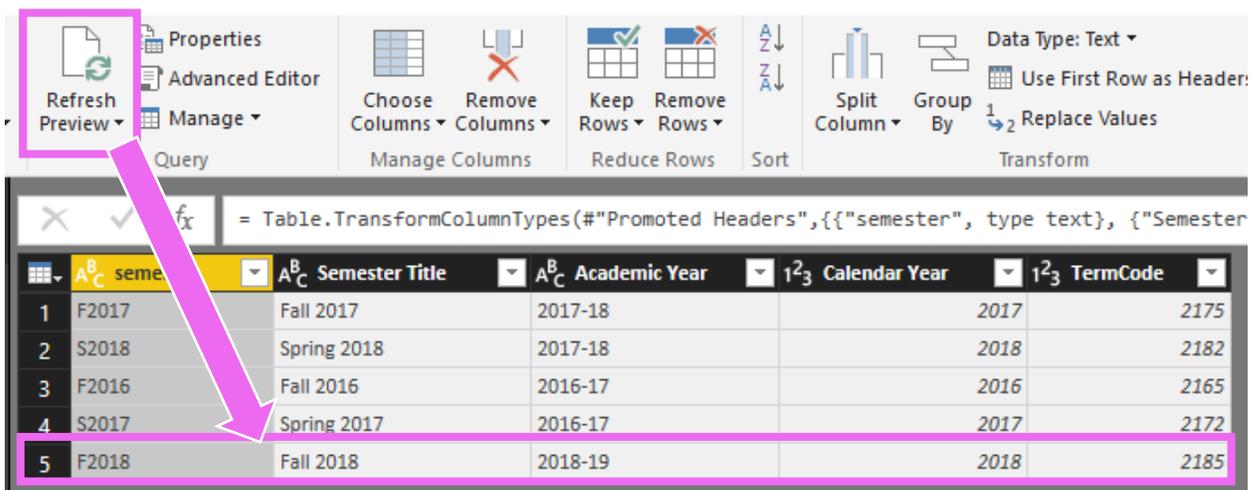


Type in additional term information for Fall 2018.

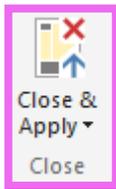
	A	B	C	D	E
1	semester	Semester	Academic	Calendar	TermCode
2	F2017	Fall 2017	2017-18	2017	2175
3	S2018	Spring 2018	2017-18	2018	2182
4	F2016	Fall 2016	2016-17	2016	2165
5	S2017	Spring 2017	2016-17	2017	2172
6	F2018	Fall 2018	2018-19	2018	2185

Save the file with its original name and location to maintain the connection in Power BI.

In the Power BI Desktop Query Editor, select DimTerm. Click Refresh Preview to see the new Fall 2018 row in the table.



Click Close and & Apply to load the new data to the report.



If the table doesn't update, manually refresh by **right-clicking on the table** and **clicking Refresh Data**.

