

# Approaches to Longitudinal Analysis

NSSE Users Workshop  
Bucknell College  
April 2015

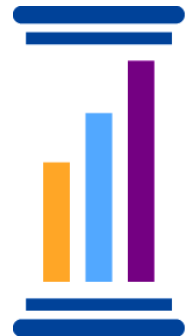


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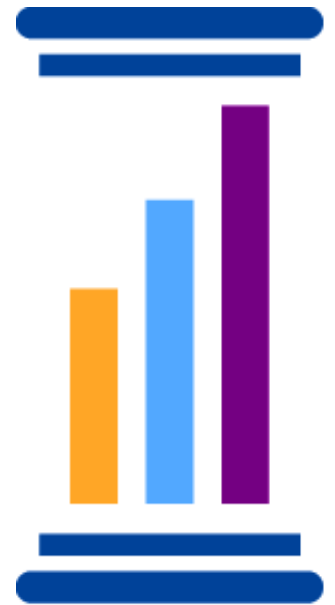
# Overview

- Introduction
- Five Multi-Year Analysis “Tasks”
  - Identifying Multi-Year Questions
  - Methods for Multi-Year Analysis
  - Data Quality
  - Changes in NSSE Over Time
  - Merging Multi-Year Data
- 2013 Survey Update Considerations
- Multi-Year Results Examples



Task 1:

# Identify and Focus on Specific Questions



# Identifying Multi-Year Questions

- Multi-year questions should be
  - *Specific*
  - *Answerable*
  - *Relevant to campus priorities*
- Exploratory studies are possible, but it is best to set limits to focus the effort

# Identifying Multi-Year Questions

## Possible Multi-Year Questions

- Confirming stability and reliability
  - *How stable was our data from one year to the next?*
- Measuring change due to campus initiatives
  - *Given the implementation of a specific campus initiative, how much did engagement change before and after?*
- Identifying trends over time
  - *What trends in the data are apparent in given engagement measures over time?*

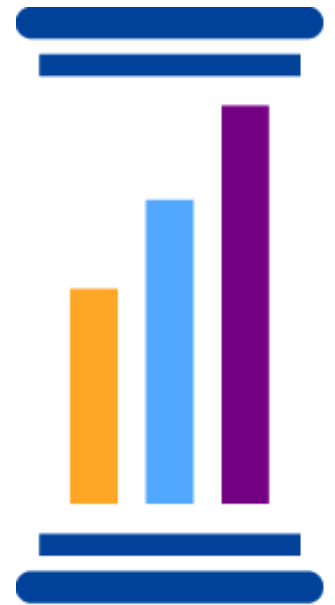
# NSSEville State University – Research Question

“Undergraduate Student Service-Learning Program” (2013-14) gives resources to students and faculty for service-learning projects.

- **Question: Did service-learning increase between 2013 and 2015? If so, did changes vary by sex?**

Task 2:

**Select and Employ  
Appropriate  
Methods of Analysis**



# Cohort Analyses

NSSE 2013

NSSE 2016

First-Year



First-Year

Senior



Senior

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A:





# Longitudinal Comparisons

NSSE 2013

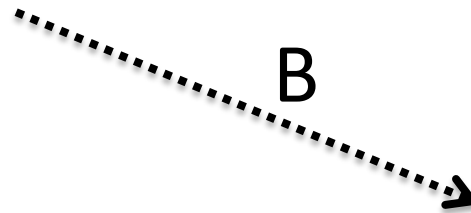
First-Year

Senior

NSSE 2016

First-Year

Senior



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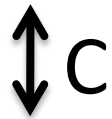
B:



# Cross-Sectional Comparisons

NSSE 2013

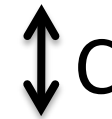
First-Year



Senior

NSSE 2016

First-Year



Senior

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C:



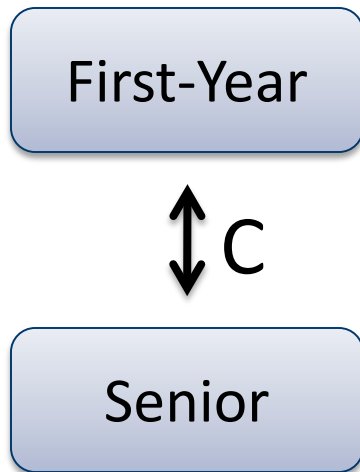
# Methods for Multi-Year Analysis

- **Important Considerations**

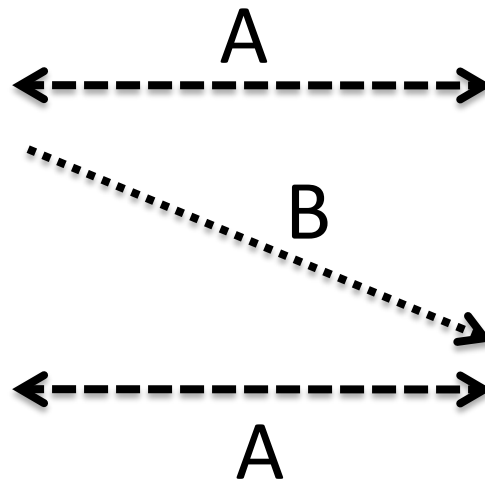
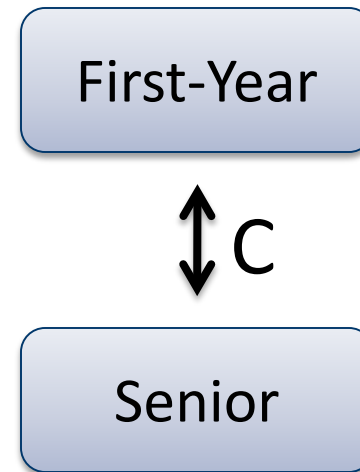
- Engagement is a process measure, not an achievement measure.
- First and senior years are different educational contexts, with different engagement patterns.
- First-years include those who will leave your institution.
- Seniors include persisters as well as transfers.
- Attrition from survey participation.

# Methods for Multi-Year Analysis

NSSE 2013



NSSE 2016



A:



B:



C:



# Methods for Multi-Year Analysis

- **Statistical Difference**

- *t*-tests
- ANOVA
  - Needs at least *three* years of data
  - Can use statistical controls
- Regression
  - Can use statistical controls

- **Practical Difference**

- Percentage change (frequencies)
- Effect size (means)



# NSSEville State University - Methods

NSSE 2013

First-Year

Senior

NSSE 2015

First-Year

Senior



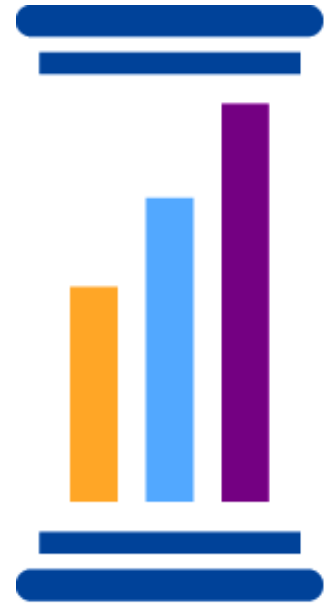
- $t$ -tests to determine statistical significance
- Effect size to determine practical significance

# Quick Stats Review

- $t$ -tests determine whether the means of two groups are statistically different
- Effect size: A measure of the strength of the relationship between two variables;  
*practical* significance
  - Cohen's  $d$  is a common measure of effect size
  - See *Contextualizing NSSE Effect Sizes*.  
For EIs, consider:
    - $> |.1|$  = small
    - $> |.3|$  = medium
    - $> |.5|$  = large

Task 3:

**Attend to Data  
Quality for Each  
Year in the Analysis**





# Data Quality

- **Data quality measures to consider**
  - Response rate
  - Sampling Error (frequencies)  
(depends on sample and population sizes)
  - Standard Error (means)  
(depends on variance and sample size)
  - Proportional representation
  - Missing data

# Data Quality: Response Rate

- **Response rate:** Percentage of a sample that completes the questionnaire
  - “Complete” → viewed the demographics page
  - NSSE 2014 average response rate was 32%, with more than half of institutions achieving 30% or higher
- Low response rates do not necessarily produce nonresponse bias
  - Nonresponse bias is the extent to which responders and nonresponders differ on key variables
  - Nonresponse bias is minimal in overall NSSE results

# Data Quality: Sampling Error

- **Sampling error:** How much responses could differ from the population
  - Based on number of respondents ( $n$ ) relative to total population ( $N$ )
  - Preferred sampling errors around  $\pm 3\%$  or  $5\%$
  - Sampling errors greater than  $\pm 10\%$  need not be dismissed entirely, but should be interpreted with caution

# Data Quality: Proportional Representation

- Determine the extent to which respondent demographics match those of your population
  - Weighting may help counter bias
  - NSSE weights data by sex and enrollment status (because females and full-time students respond at higher rates)

# Data Quality

- Start with the **Administration Summary** and **Respondent Characteristics** reports in your *Institutional Report*
  - Response rates
  - Sampling errors
  - Student characteristics

# NSSEville State University – Data Quality

## 2013

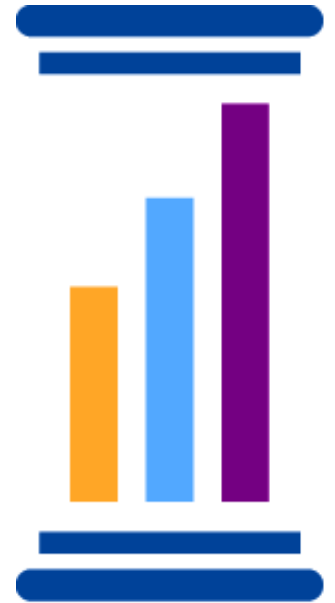
- Response Rate: 32%  
(30% FY/34% SR)
- Sampling Error:  
4.1% FY/4.4% SR
- 81% FY Female,
- 74% SR Female

## 2015

- Response Rate: 35%  
(36% FY/34% SR)
- Sampling Error:  
3.5% FY/3.5% SR
- 69% FY Female,
- 68% SR Female

Task 4:

# Take into Account Changes in NSSE Items and Reports Across Years



# Changes in NSSE Over Time

- Big changes in 2013!
- *NSSE Item and Variable Changes*
  - Question changes
  - Response value changes



## NSSE 2013 to 2014 Item and Variable Changes

View the codebooks at [nsse.iub.edu/html/data\\_codebooks.cfm](http://nsse.iub.edu/html/data_codebooks.cfm)

(August 2014)

NSSE 2013 Items and Variables			NSSE 2014 Items and Variables			Comparisons
Variable Name	Variable Label	Response Options	Variable Name	Variable Label	Response Options	2013-2014
tmread	Of the time you spend preparing for class in a typical 7-day week, about how many hours are on <i>assigned reading</i> ?	1=0 Hours per week 2=1-5 3=6-10 4=11-15 5=16-20 6=21-25 7=26-30 8=More than 30	reading	Of the time you spend preparing for class in a typical 7-day week, about how much is on <i>assigned reading</i> ?	1=Very little 2=Some 3=About half 4=Most 5=Almost all	Major change. Item was changed to reduce cognitive burden associated with an enumerated response, and to prevent inconsistencies with the total amount of reported class preparation time.
tmreadhrs	Estimated hours: <i>tmread</i> recoded by NSSE using response range midpoints.		tmreadinghrs	Estimated number of hours on assigned reading calculated by NSSE, multiplying <i>tmprephrs</i> by a proportion of <i>reading</i> (Very little=.10; Some=.25; About half=.50; Most=.75; Almost all=.90).		Major change. New estimate based on a different formula and variables. Items not comparable.



# Changes in NSSE Over Time

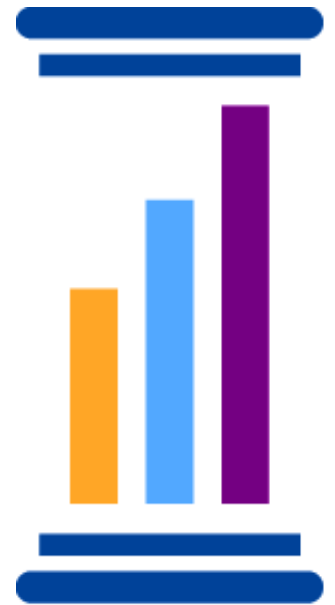
- Important variables to *always* consider:
  - **IRclass**: Institution reported class rank (1 = First-Year, 4 = Senior)
  - **eligible**: Identifies eligibility
  - **sample**
    - 1 thru 3 (census, random sample, random oversample)
    - 4 (targeted oversample), 5 (local), 6 (experiment)
  - **weight1** (used in NSSE reports) and **weight2** (weights up to population numbers)
  - Any other controlling, independent, or dependent variables

# Changes in NSSE Over Time

- NSSEville will use
  - **IRclass**: first-year and senior
  - **eligible**: eligible students
  - **sample**: randomly sampled students
  - **weight1**
  - **servcourse** to determine if participation in service-learning has changed
  - **IRsex/IRgender** to see if there are differences by sex
    - Note that the variable IRsex changed variable names from 2013 to 2014!

Task 5:

# Merge Multiple Years of Data



# Merging Multi-Year Data

- Account for any changes in variable names
- Don't forget to create a variable to account for the data's year!
- Merge options
  - SPSS pull-down menus
    - Data -> Merge Files -> Add Cases
  - Write your own syntax

# Merging Multi-Year Data with SPSS

- Save a copy of each year of your data with only the variables you want to “keep”
- In each year of your data create the same variable **Year** with a different value representing each year
- Open your “base year” and add the next year
  - Data -> Merge Files -> Add Cases
  - Repeat for each additional year

# Merging Multi-Year NSSEville State University Data

- NSSEville wants to “keep” the variables IRclass, eligible, sample, weight1, servcourse, and IRsex/IRgender

NSSE 2013 Items and Variables			NSSE 2014 Items and Variables			Comparisons
<i>Variable Name</i>	<i>Variable Label</i>	<i>Response Options</i>	<i>Variable Name</i>	<i>Variable Label</i>	<i>Response Options</i>	<i>2013–2014</i>
IRgender	Institution-reported gender	0=Female 1=Male	IRsex	Institution-reported sex	0=Female 1=Male	Variable name changed to differentiate "sex" from "gender."

- We need to account for the change in variable names between 2013 and 2014

# Merging Multi-Year NSSEville State University Data

```
GET FILE='C:\temp\NSSEville 2013.sav' /KEEP IRclass eligible sample weight1 IRgender servcourse.  
COMPUTE Year = 2013 .  
VARIABLE LABELS Year 'The year the data were collected' .  
VALUE LABELS Year  
    2013 '2013' .  
EXECUTE .  
RENAME VARIABLES IRgender=IRsex.  
SAVE OUTFILE='C:\temp\2013.sav'.
```

```
GET FILE='C:\temp\NSSEville 2015.sav' /KEEP IRclass eligible sample weight1 IRsex servcourse.  
COMPUTE Year = 2015 .  
VARIABLE LABELS Year 'The year the data was collected' .  
VALUE LABELS Year  
    2015 '2015' .  
EXECUTE .  
SAVE OUTFILE='C:\temp\2015.sav'.
```

```
GET FILE='C:\temp\2013.sav'.  
ADD FILES /FILE=*  
    /FILE='C:\temp\2015.sav'.  
EXECUTE.  
SAVE OUTFILE='C:\temp\NSSEville 2013 2015.sav'.
```

After running this syntax, I now have an SPSS dataset called “NSSEville 2013 2015” with the six variables I wanted to use in my analyses and a new variable that identifies the year of the data.

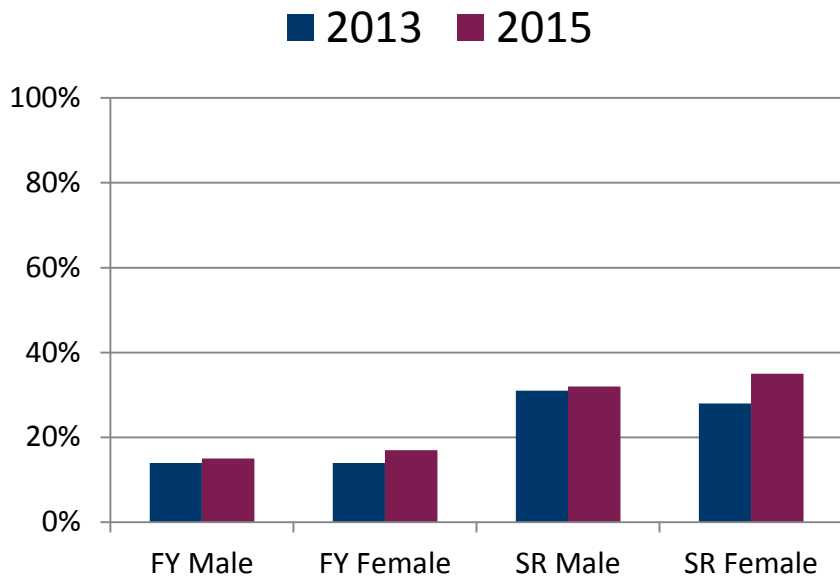
# NSSEville Results

**About how many of your courses at this institution have included a community-based project (service-learning)? [None, Some, Most, All]**

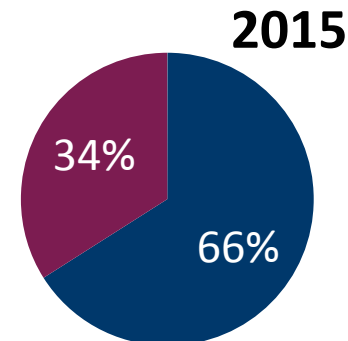
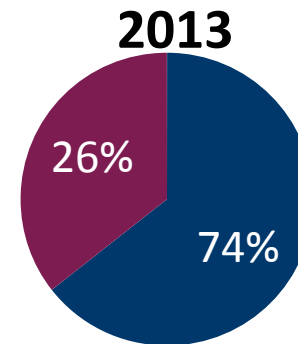
	N	% at least "Some"	Statistical Difference?	Effect Size
2013 FY Male	69	14%	NO	
2015 FY Male	133	15%		
2013 FY Female	306	14%	NO	
2015 FY Female	309	17%		
2013 SR Male	82	31%	NO	
2015 SR Male	143	32%		
2013 SR Female	238	28%	YES***	.13 (small)
2015 SR Female	325	35%		



# NSSEville Results



Percent of seniors participating in service-learning (in at least *some* of their courses) by sex

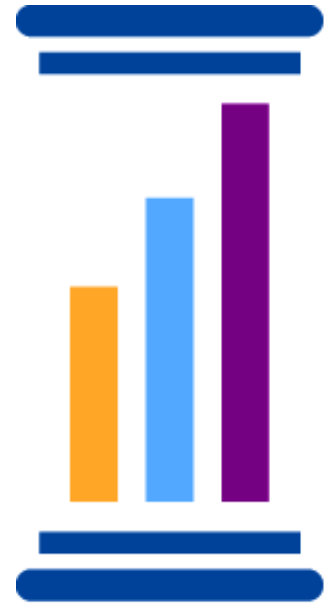


■ None

■ at least Some

About how many courses at this institution have included a community-based project (service-learning)

# 2013 Survey Update Considerations



# Before and After the Update

- Survey overhaul in 2013
- If you're using longitudinal data before 2013
  - See the NSSE website for guides and resources
  - See your **Multi-Year Benchmark Report**
- If you're using longitudinal data after 2012
  - Use the methods and resources in this presentation
  - Look for guides and resources on the NSSE website later this fall
  - See your 2015 **Multi-Year Engagement Indicator** report (if applicable)

# Analyzing Data Before and After the Update

- We strongly recommend against trying to analyze longitudinal data before and after the update (2012 and 2015 data, for example)
- Benchmark scores and Engagement Indicator scores CANNOT be compared
  - There is no way to convert Benchmark and Engagement Indicator scores to be comparable
- Only a quarter of survey items remained the same but they should be compared with caution

# Comparing the Comparisons

NSSE 2011

NSSE 2013

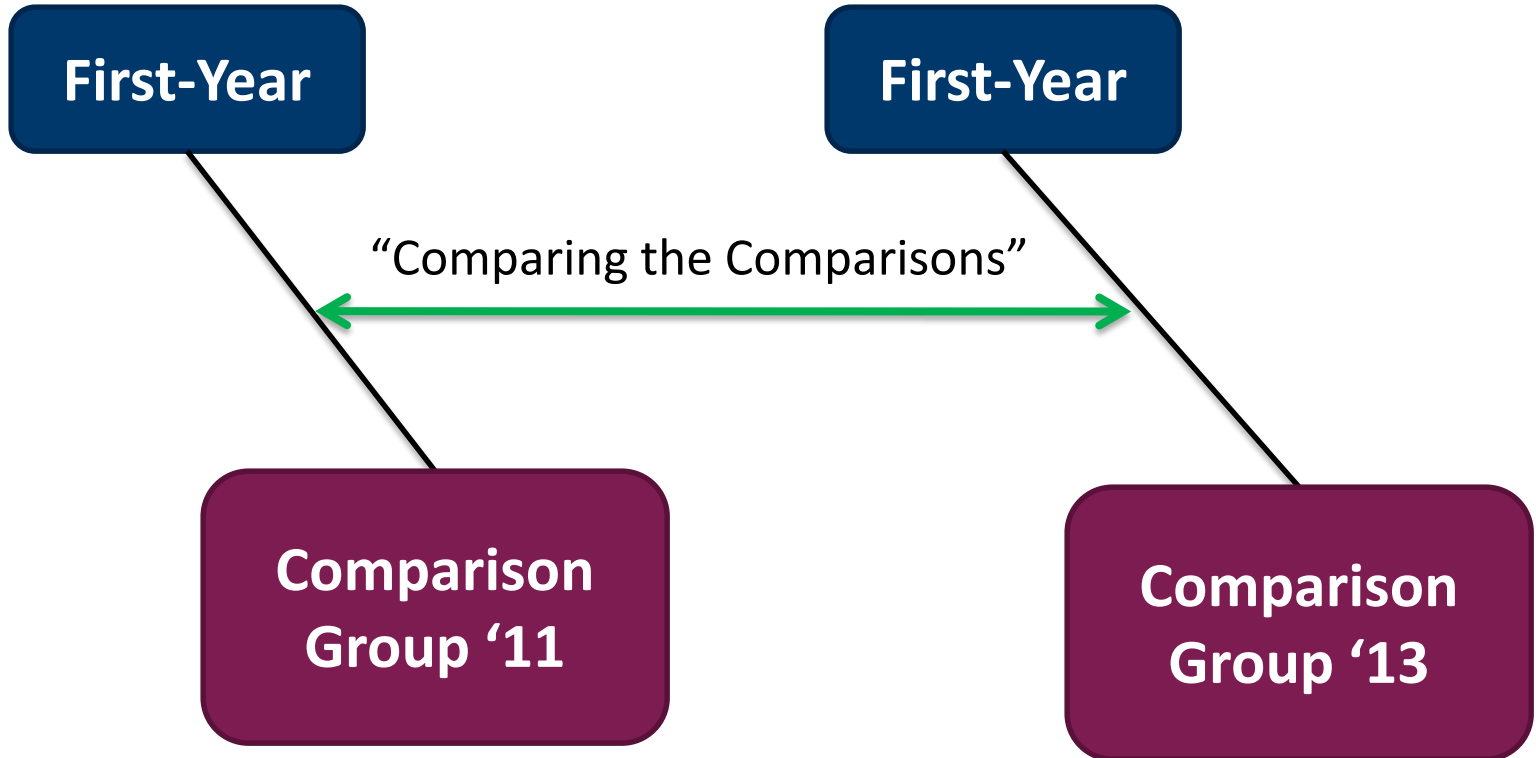
First-Year

First-Year

“Comparing the Comparisons”

Comparison  
Group ‘11

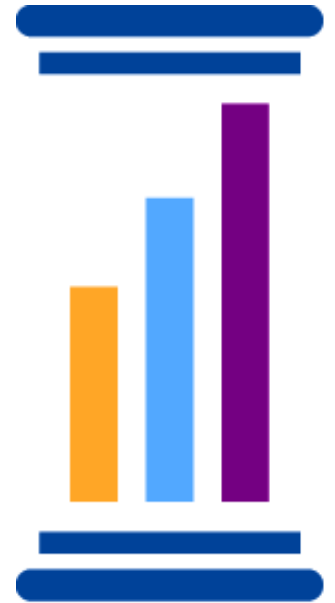
Comparison  
Group ‘13



# Comparing the Comparisons

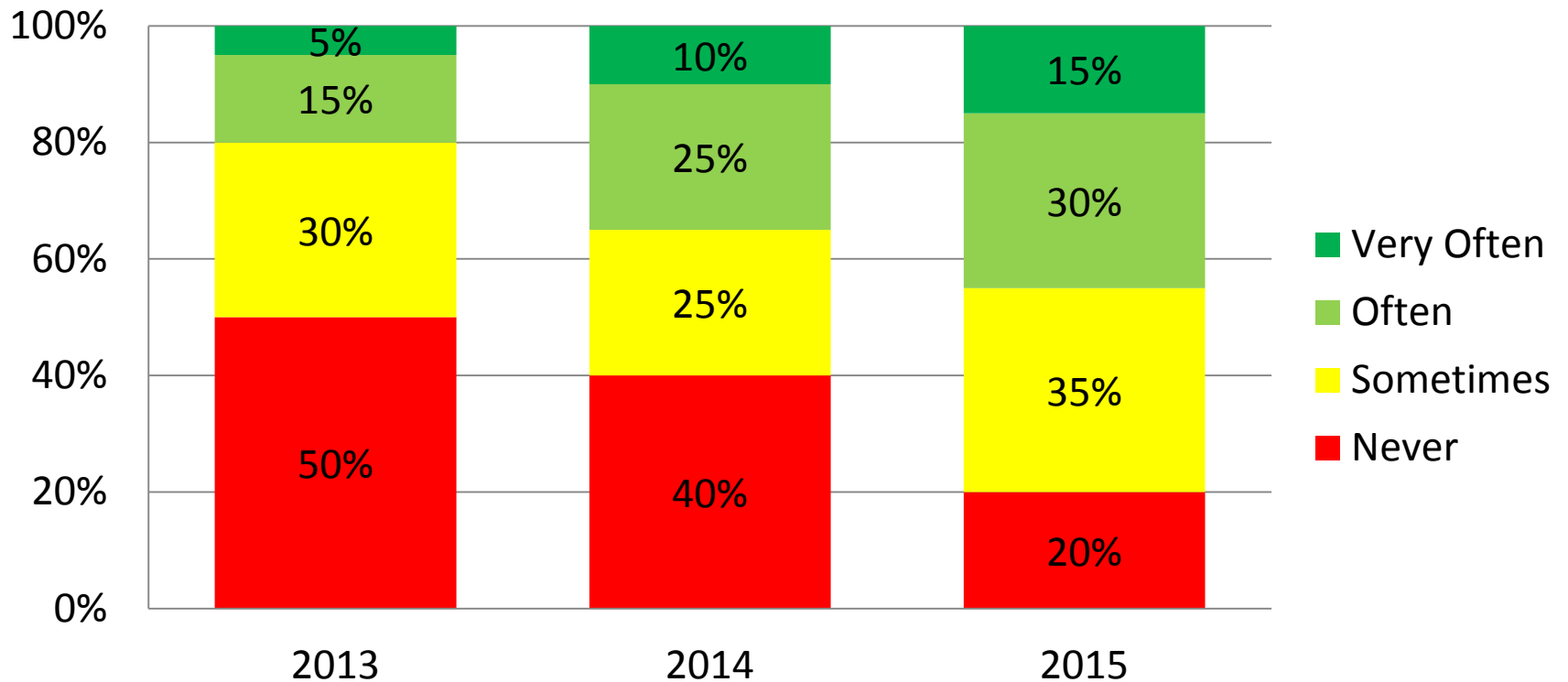
- If comparing the comparisons using Benchmark scores and Engagement Indicator scores, compare the comparisons for individual items within these measures to see how individual items may drive overall scores
- Note that comparison groups will not likely be identical over time so any comparison of comparisons should be made with caution

# Multi-Year Results Examples



# Multi-Year Results

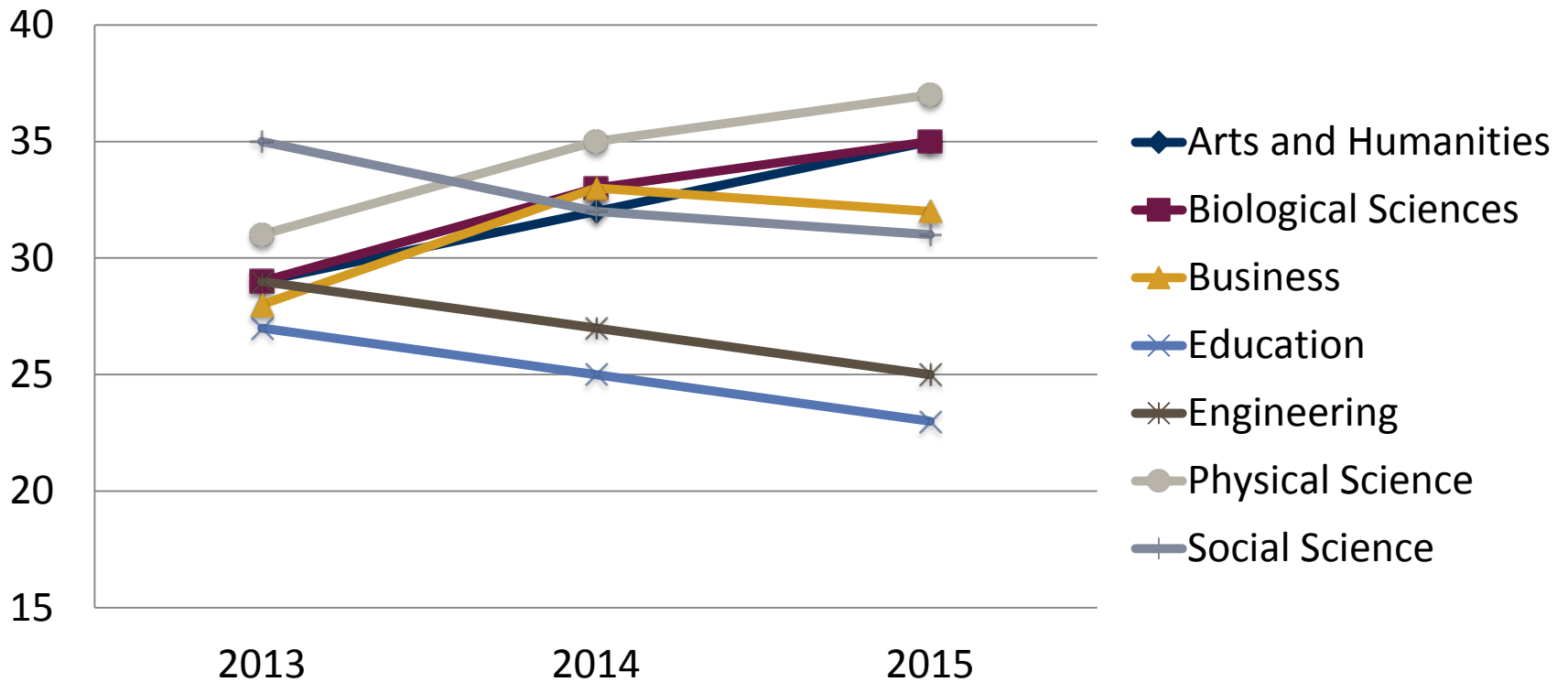
Percentage of students that explained course material to one or more students



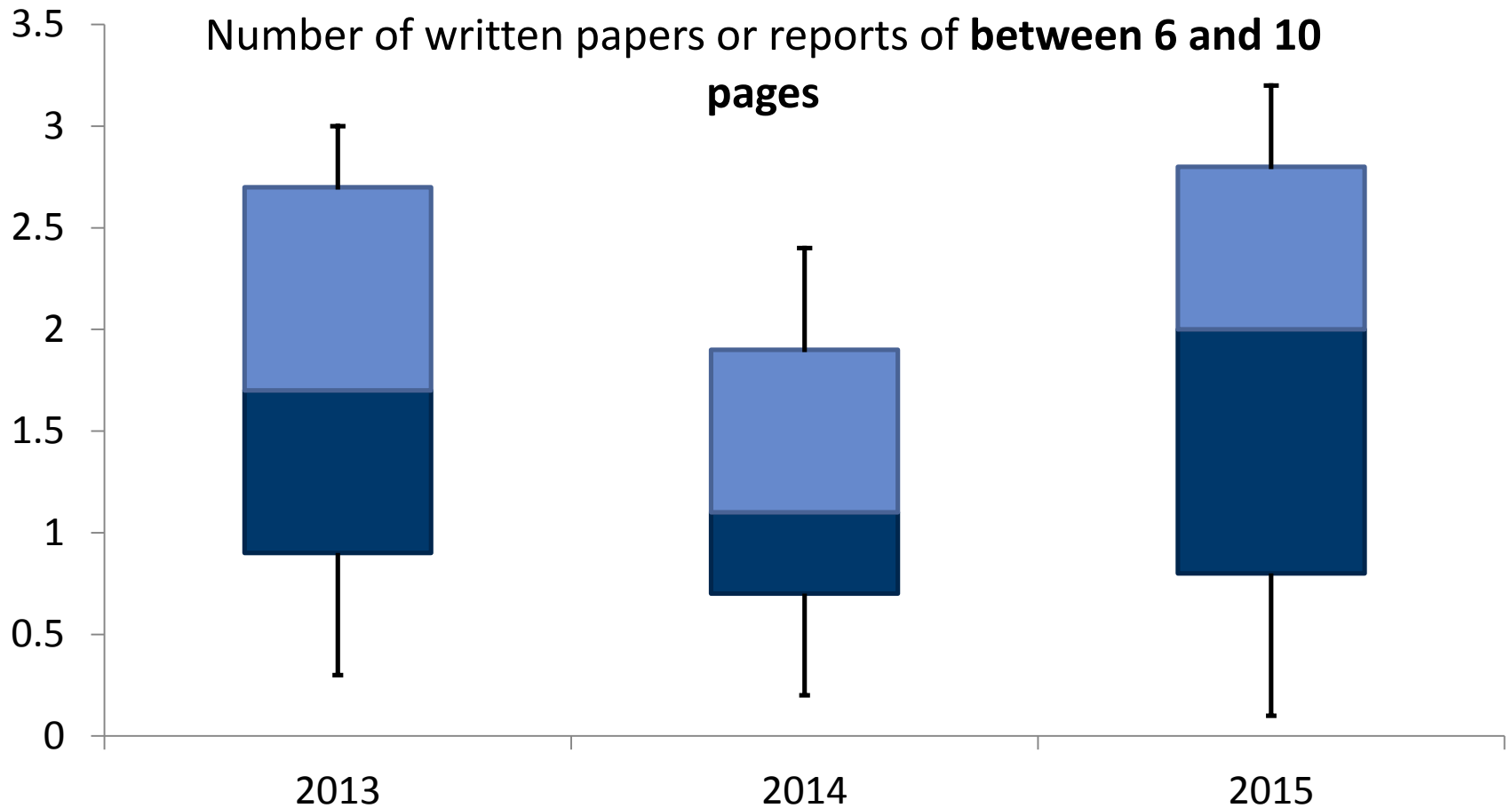


# Multi-Year Results

Percentage of excellent ratings of the quality of interactions with academic advisors



# Multi-Year Results



# Questions?

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