

Mathematical Reasoning Competency

ASSESSMENT BRIEF UPDATE

2015 TO 2018

How is Mathematical Reasoning Defined?

**The General Education
Program Governance &
Policies document**

specifies

G2

course competencies.

Upon successful completion of the G2 sequence, students will be able to:

- a) Explain information presented in mathematical forms
- b) Convert relevant information into various mathematical forms (e.g. equations, graphs, diagram, tables, words)
- c) Perform calculations (e.g. probabilities, percentages, frequencies) to solve problems.
- d) Make judgments and draw appropriate conclusion based on the quantitative analysis of data, while recognizing the limits of this analysis.

How is Mathematical Reasoning Assessed?

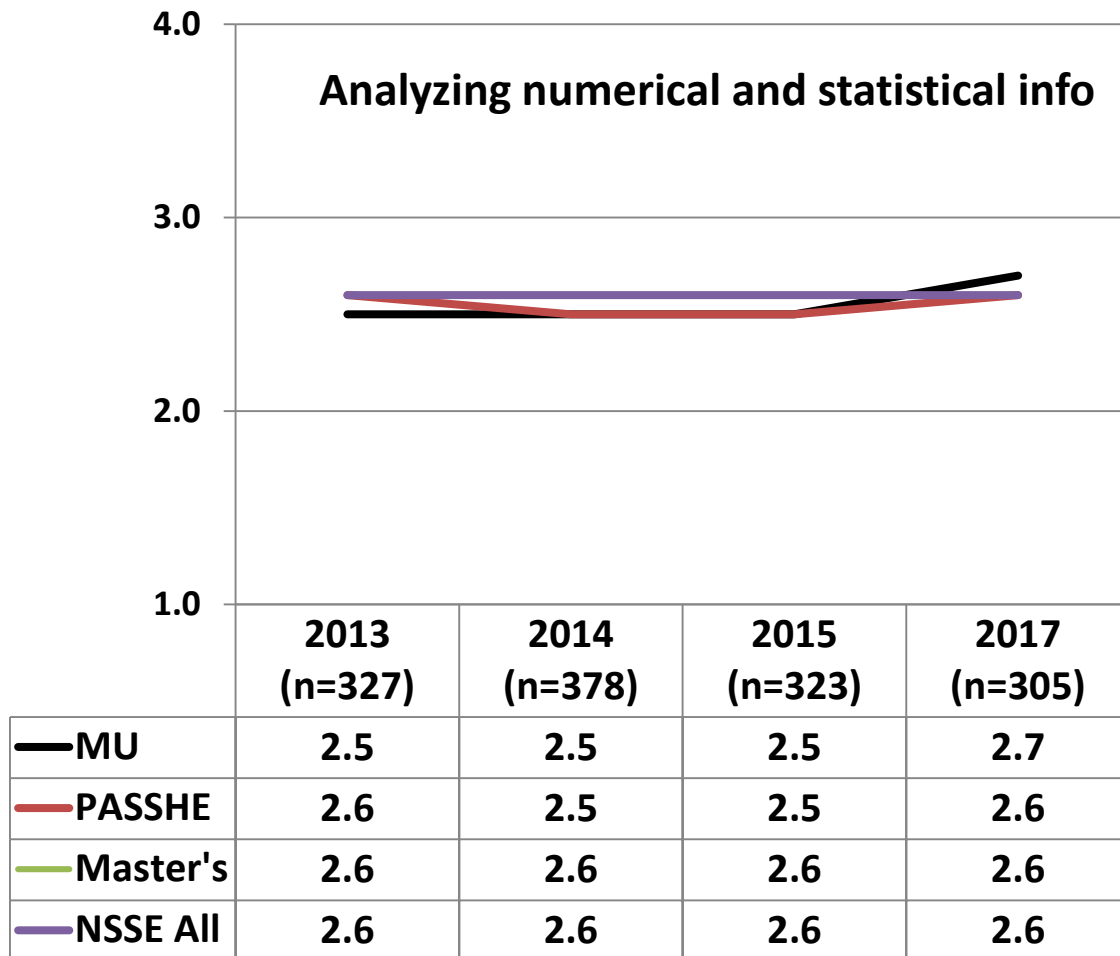
In the general education program, Mathematical Reasoning is assessed by both direct and indirect evidence.

Measures	2015-16	2016-17	2017-18	2018-19
TOSLS MU				
Lower Division Courses (GenEd PreTest/PostTest or Major PreTest)	not collected	414 PreTest 265 PostTest BIOL 100, ESCI 120, PHYS 117 (Spring 2017)	864 PreTest 581 PostTest BIOL 100, ESCI 102/104/120, PHYS 104/117 UNIV 103 (Math/CSCI) (Fall 2017)	258 PreTest CHEM 111 UNIV 103 (Math/CSCI) (Fall 2018)
Upper Division Courses (PreTest Only in Major-based courses)	not collected	not collected	not collected	36 PreTest CHEM 487, ESCI 441 (Fall 2018)
National Survey of Student Engagement	not collected	307 First-Years 396 Seniors	not collected	Being collected
Senior Exit Survey	815 seniors	931 seniors	848 seniors	Being collected
Alumni Job Placement Survey (~1 yr out)	750 alumni	622 alumni	686 alumni	To be collected fall 2019
Internship Field Supervisor Feedback	not applicable	not applicable	not applicable	not applicable

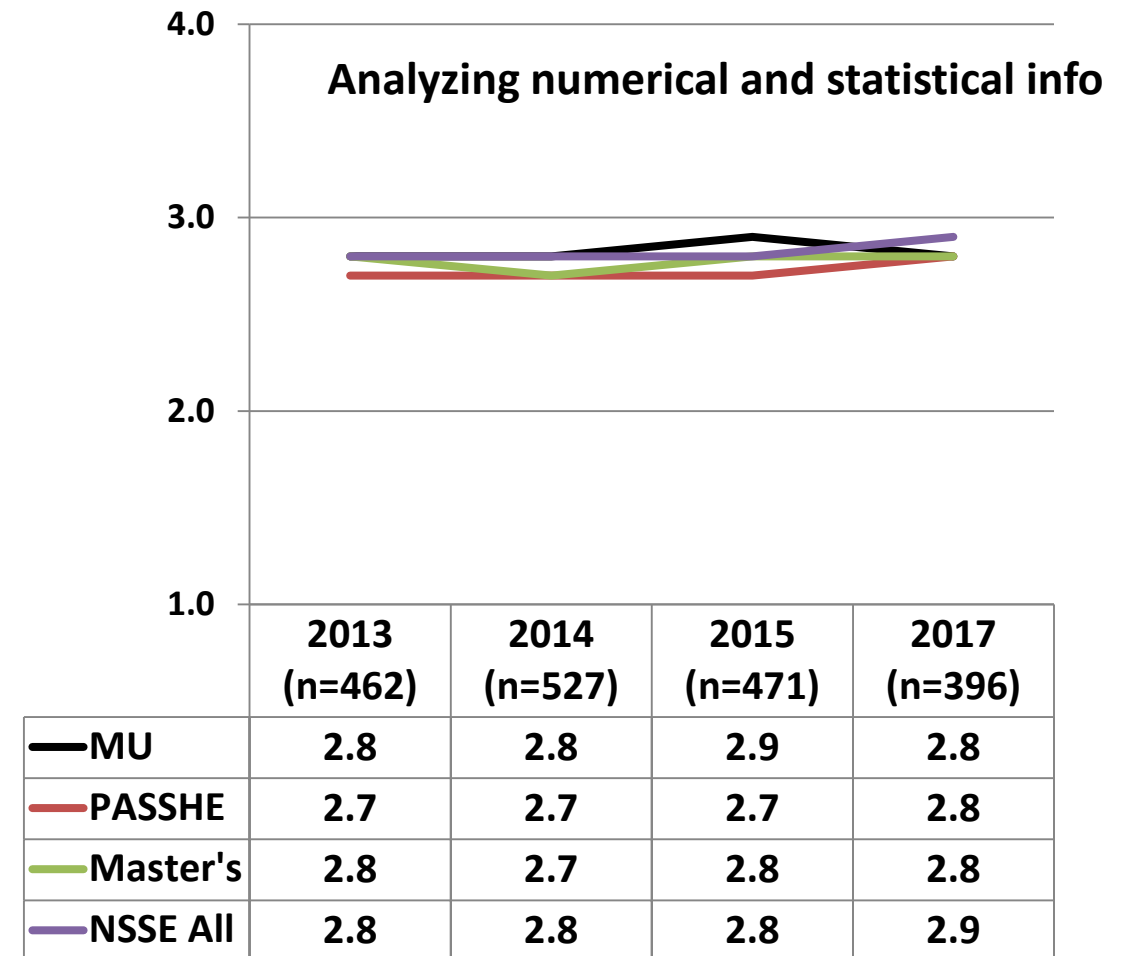
Comparison of Freshmen and Senior *Perceptions* of Mathematical Reasoning

[Experience contributed to your knowledge, skills, and personal development where 1=Very little, 2=Some, 3=Quite a bit, 4=Very much]

FIRST-YEAR STUDENTS



SENIORS

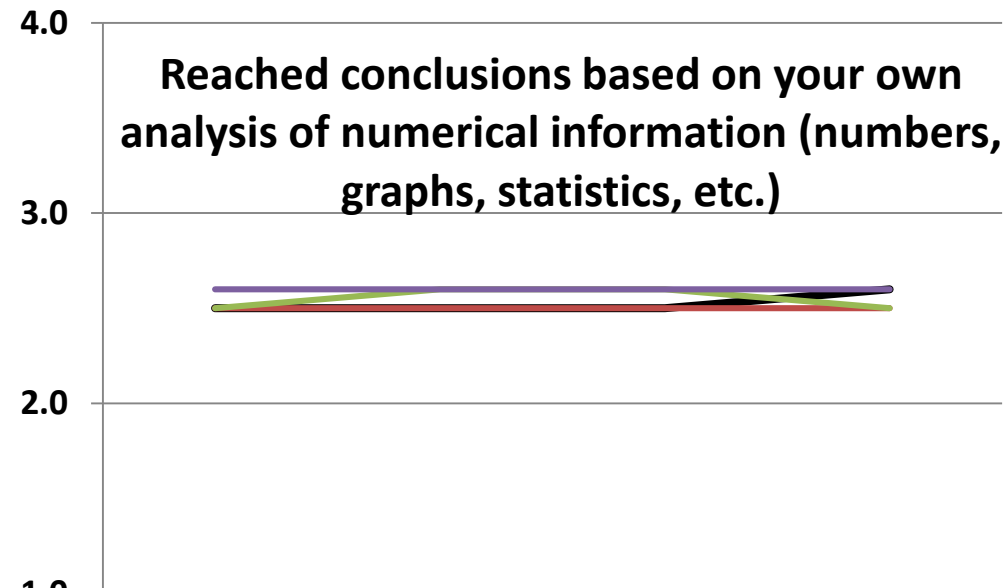


NOTE: Per National Survey of Student Engagement offered respective spring semesters. Master's includes peers at Master's-level publics and privates (per Carnegie Classification). National includes all peers at all four-year institutions participating during the time period.

Comparison of Freshmen and Senior *Perceptions* of Mathematical Reasoning

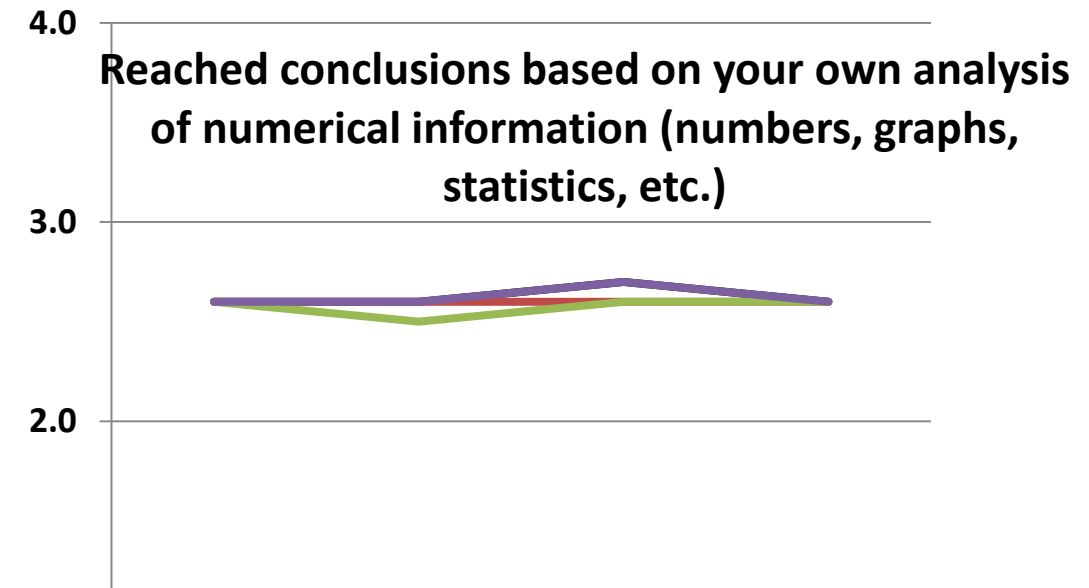
[During the current school year, about how much have you done the following? 1=Never, 2=Sometimes, 3=Often, 4=Very Often?]

FIRST-YEAR STUDENTS



	2013 (n=385)	2014 (n=435)	2015 (n=384)	2017 (n=383)
— MU	2.5	2.5	2.5	2.6
— PASSHE	2.5	2.5	2.5	2.5
— Master's	2.5	2.6	2.6	2.5
— NSSE All	2.6	2.6	2.6	2.6

SENIORS



	2013 (n=512)	2014 (n=554)	2015 (n=500)	2017 (n=445)
— MU	2.6	2.6	2.7	2.6
— PASSHE	2.6	2.6	2.6	2.6
— Master's	2.6	2.5	2.6	2.6
— NSSE All	2.6	2.6	2.7	2.6

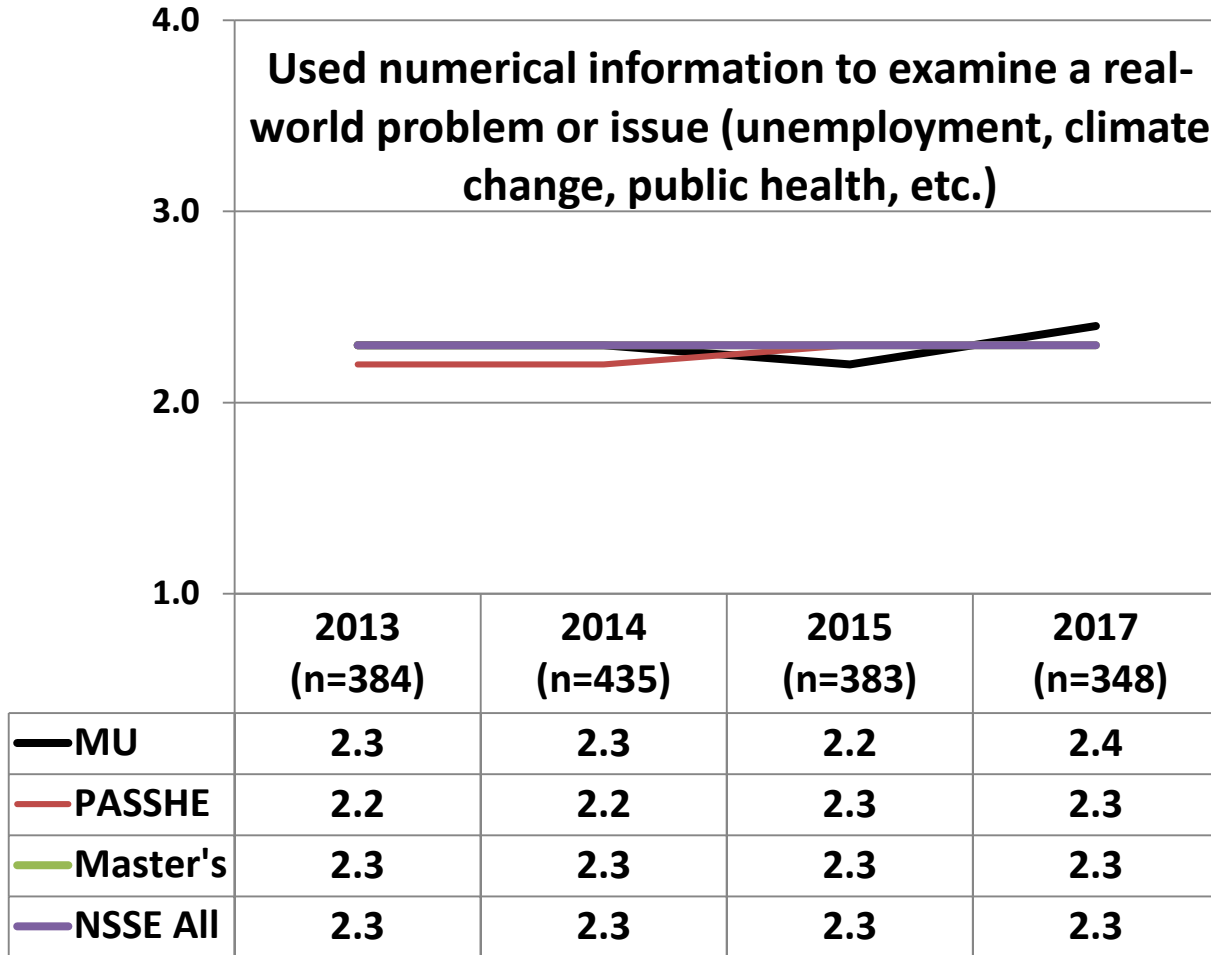
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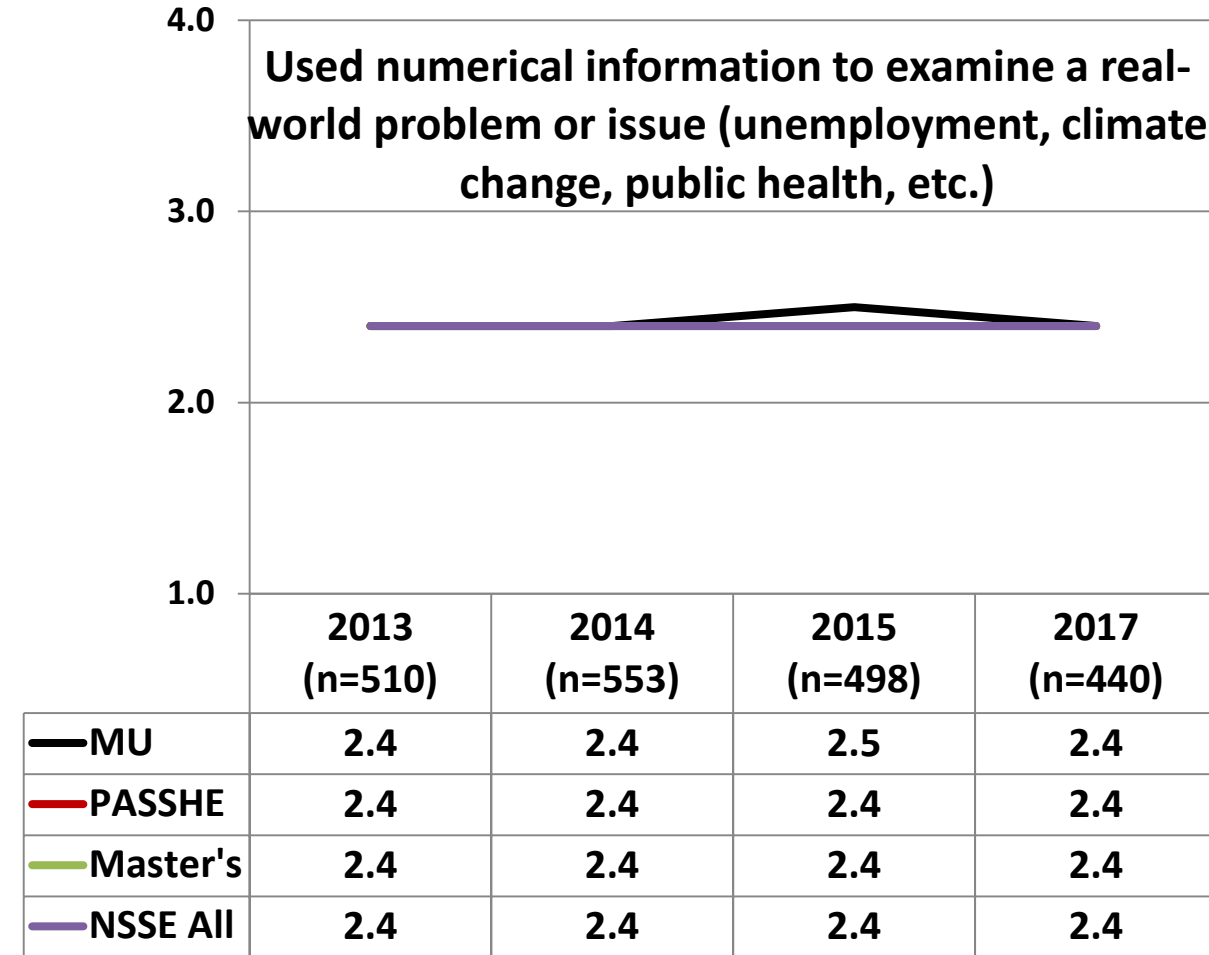
FIRST-YEAR STUDENTS

Used numerical information to examine a real-world problem or issue (unemployment, climate change, public health, etc.)



SENIORS

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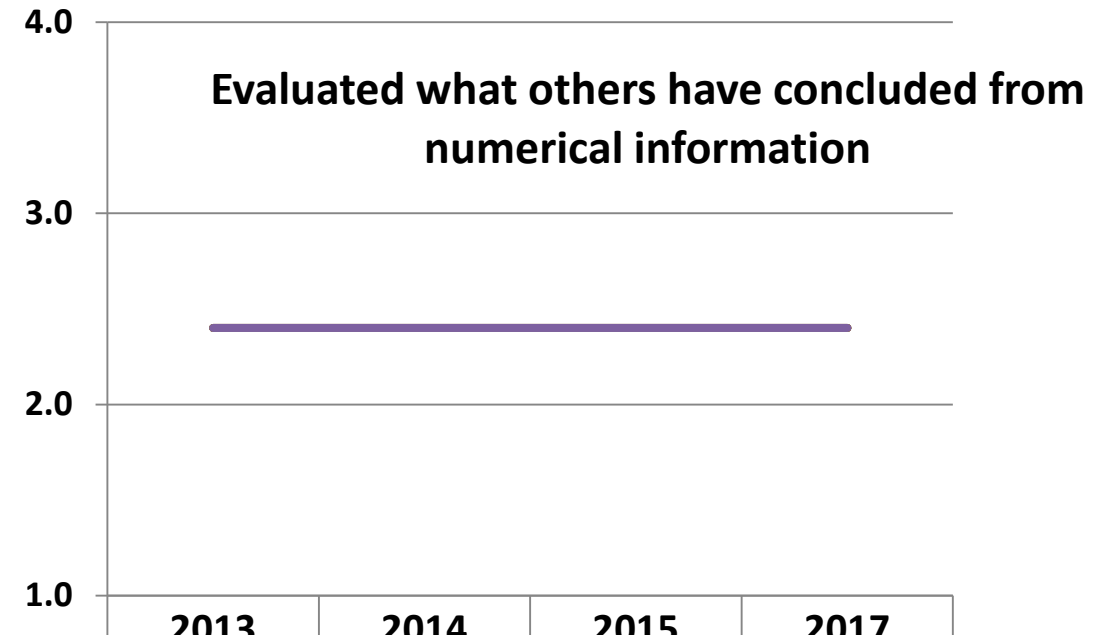
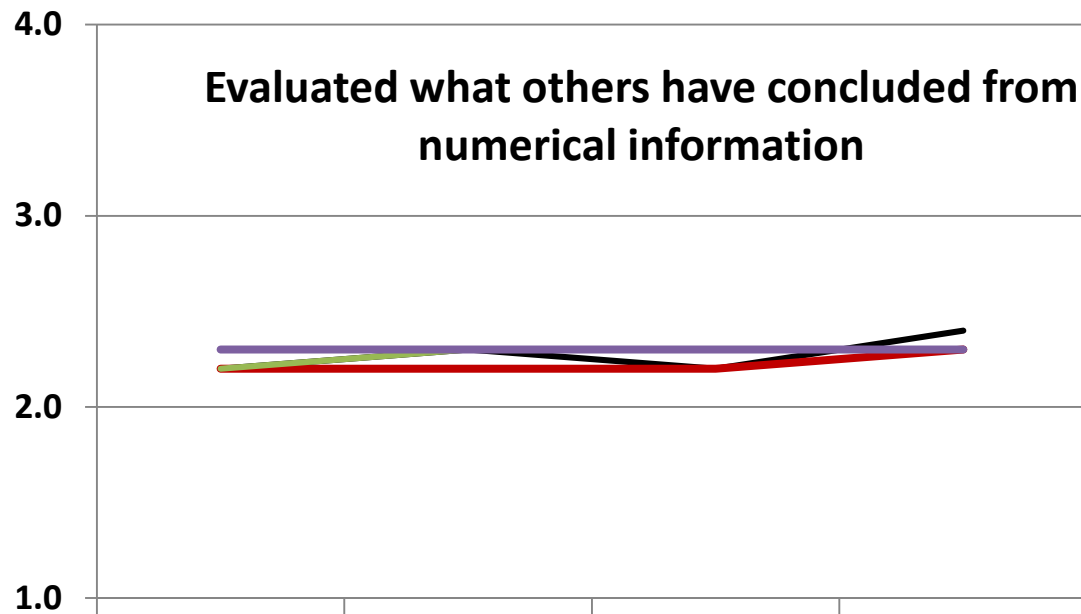
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Comparison of Freshmen and Senior *Perceptions* of Mathematical Reasoning

[During the current school year, about how much have you done the following? 1=Never, 2=Sometimes, 3=Often, 4=Very Often?]

FIRST-YEAR STUDENTS

SENIORS



	2013 (n=383)	2014 (n=432)	2015 (n=382)	2017 (n=349)
— MU	2.2	2.3	2.2	2.4
— PASSHE	2.2	2.2	2.2	2.3
— Master's	2.2	2.3	2.3	2.3
— NSSE All	2.3	2.3	2.3	2.3

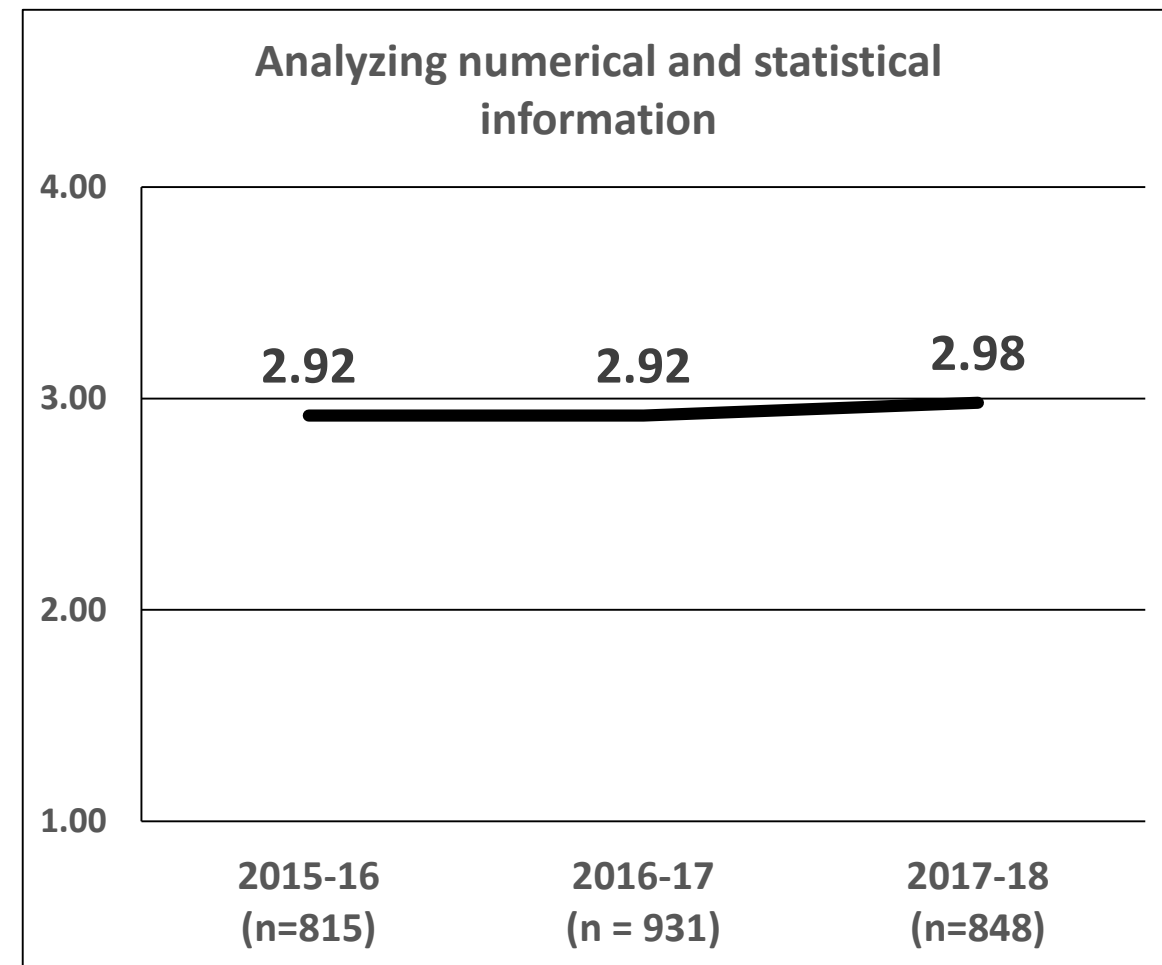
	2013 (n=504)	2014 (n=550)	2015 (n=496)	2017 (n=444)
— MU	2.4	2.4	2.4	2.4
— PASSHE	2.4	2.4	2.4	2.4
— Master's	2.4	2.4	2.4	2.4
— NSSE All	2.4	2.4	2.4	2.4

NOTE: Per National Survey of Student Engagement offered respective spring semesters. Master's includes peers at Master's-level publics and privates (per Carnegie Classification). National includes all peers at all four-year institutions participating during the time period.

Comparison of Senior & Alumni *Perceptions* of Mathematical Reasoning

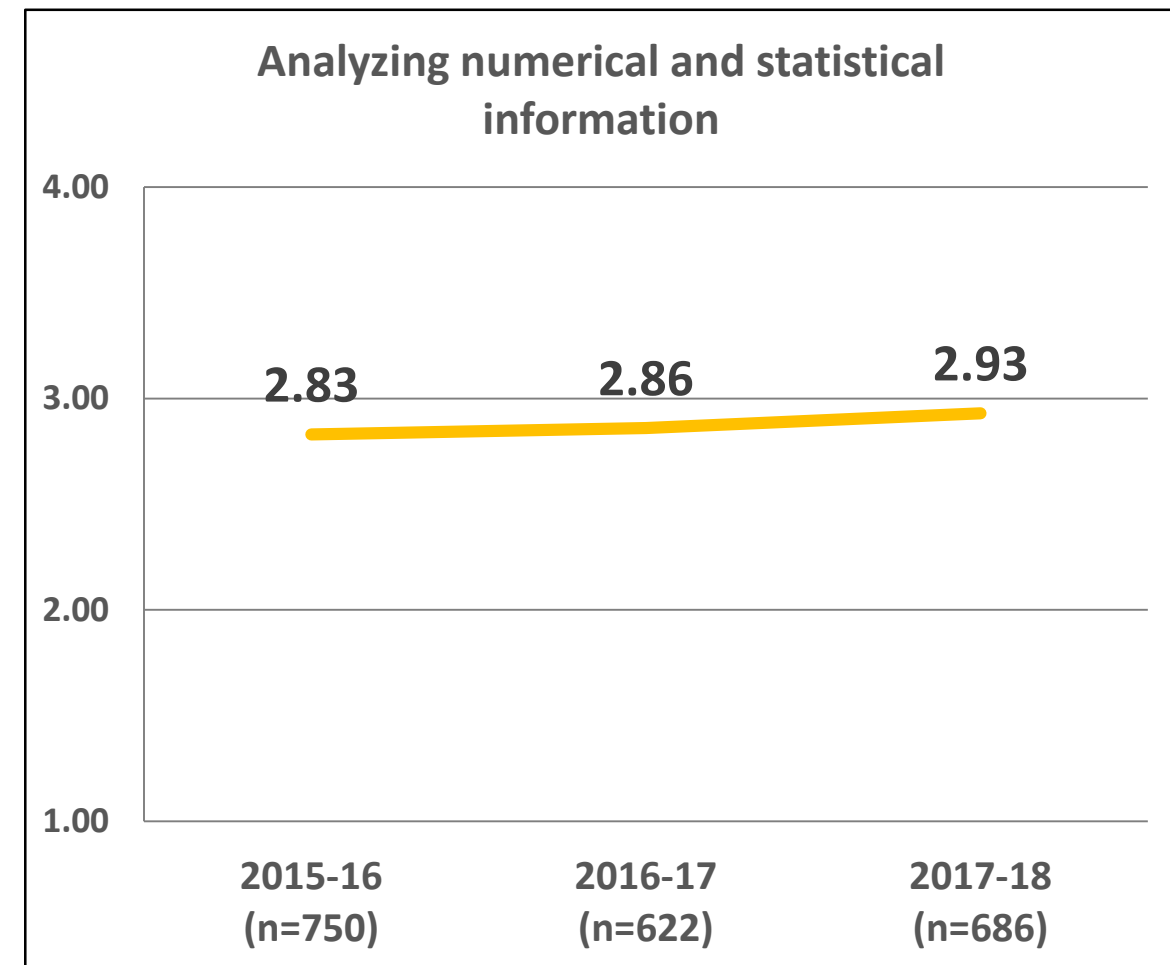
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SENIORS AT GRADUATION



[Senior perceptions per Senior Exit Survey administered last two weeks before commencement.]

ALUMNI 6 TO 10 MONTHS OUT



[Alumni perceptions per Alumni Job Placement Survey administered about six to ten months after commencement.]

Student *Performance* on Mathematical Reasoning (TOSLS MU or EXAMS)

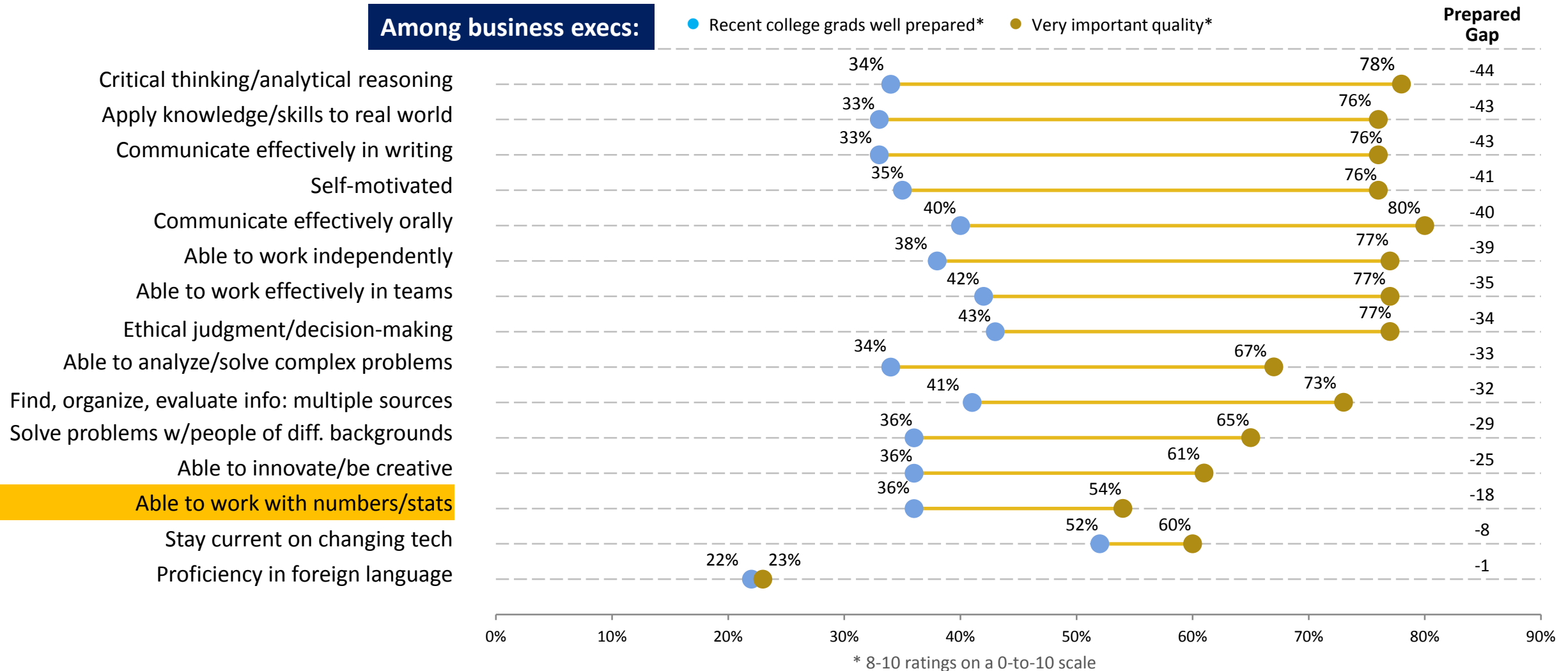
Mathematical Reasoning (Items from TOSLS-MU)	Q#	100 Level Non-Majors Pre-Test Mean (Spring 2017) (n=414)	100 Level Non-Majors Post-Test Mean (Spring 2017) (n=265)	Q#	100 Level Non-Majors Pre-Test Mean (Fall 2017) (n=864)	100 Level Non-Majors Post-Test Mean (Fall 2017) (n=581)	Q#	100 Level Majors Pre-Test Mean (Fall 2018) (n=258)	400 Level Majors Pre-Test Mean (Fall 2018) (n=36)
	Interpretation	15	50.9%	57.2%	14	46.5%	55.3%	14	62.7%
17		45.9%	48.0%	16	42.2%	47.5%	16	54.7%	75.3%
Representation	2	41.5%	47.6%	2	45.6%	48.4%	2	61.8%	77.7%
	16	31.0%	36.5%	15	31.5%	39.3%	15	42.6%	50.3%
Calculation	10	24.0%	27.5%	9	22.7%	28.8%	9	36.8%	63.7%
	20	51.0%	58.3%	11	66.1%	69.5%	11	70.1%	94.7%
Application / Analysis	18	52.9%	61.3%	17	51.2%	58.3%	17	61.1%	67.0%
	21	56.8%	66.1%	19	63.1%	69.3%	19	72.4%	83.7%

MU instruments are located on your table.

Assessment initiative led by General Education Coordinator, Dr. Lynn Marquez, in collaboration with SCTE faculty.

EXECUTIVES identification of gaps in recent graduates' preparedness on key learning outcomes. [National Survey]

Among business execs:



[AAC&U Fulfilling the American Dream: Liberal Education and the Future of Work/2018 Employers Survey*Hart Research]

HIRING MANAGERS identification of gaps in recent graduates' preparedness on key learning outcomes. [National Survey]

Among hiring managers:



[AAC&U Fulfilling the American Dream: Liberal Education and the Future of Work/2018 Employers Survey*Hart Research]

Discussion

What do the results mean?

In your small group, discuss the follow:

1) What does the evidence demonstrate?

- Does the assessment evidence presented demonstrate added value? How?
- Are students gaining skills as presented in these results?

2) Are you satisfied with results?

- If so, what learning experiences contribute to the achievement of the competency?
- If not, how might we make improvements to the learning experiences?

3) Share highlights of your discussion with the larger group.