

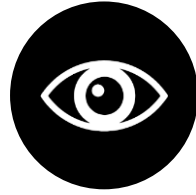
SHOW ME THE NUMBERS

Basic principles of data visualization

Lisa Trescott (she/her)
Research Analyst, MiraCosta College

**Increase understanding while
decreasing cognitive load**

AGENDA



PREATTENTIVE ATTRIBUTES



COLOR



CHART SELECTION



CLUTTER

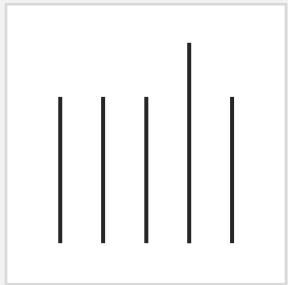


PUTTING IT ALL TOGETHER

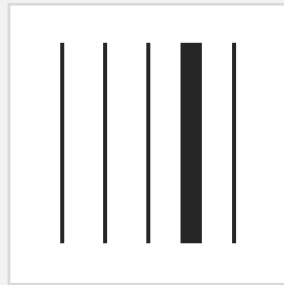
**PREATTENTIVE
ATTRIBUTES**



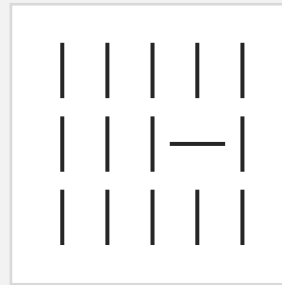
Preattentive attributes are visual properties we notice and process **unconsciously**



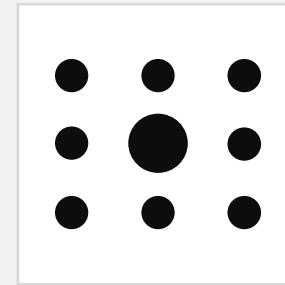
Length



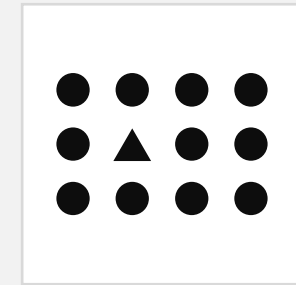
Width



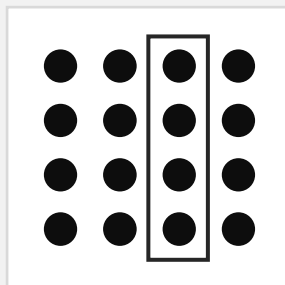
Orientation



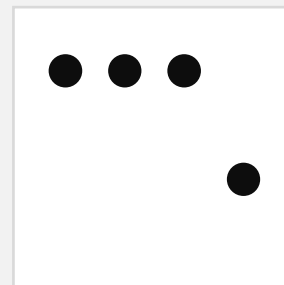
Size



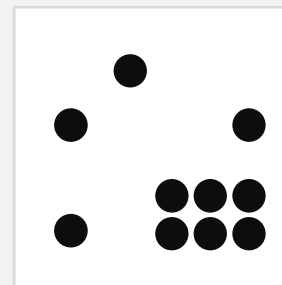
Shape



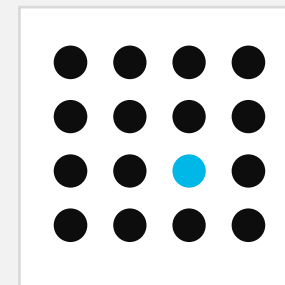
Enclosure



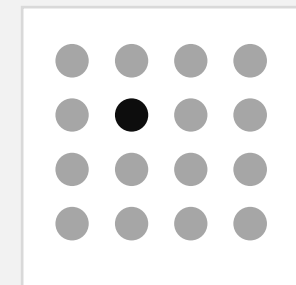
Position



Grouping



Color (hue)



Color (Intensity)

COLOR



Color

When used correctly, color is the most powerful tool you have to draw attention

GUIDELINES

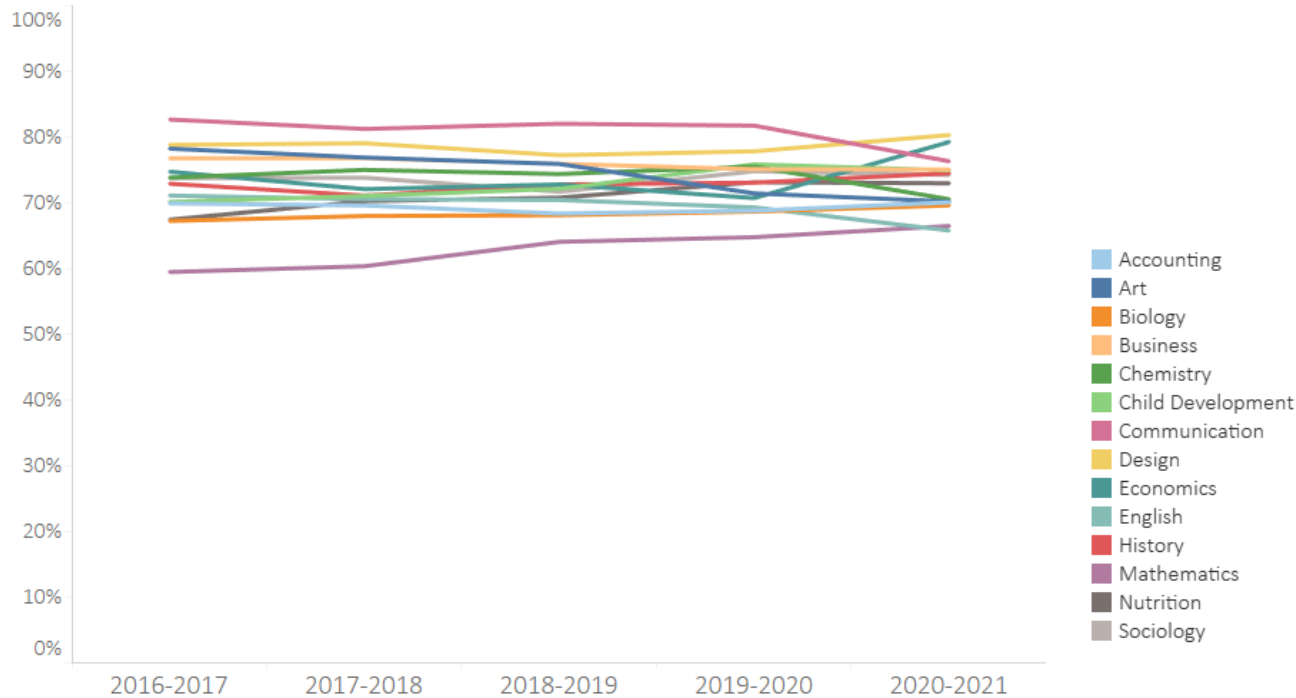
- Use color sparingly
- Make color meaningful
- Design with colorblind in mind
- Consider leveraging school colors

USE COLOR SPARINGLY

Too many colors prevent anything from standing out, and we lose color's preattentive power

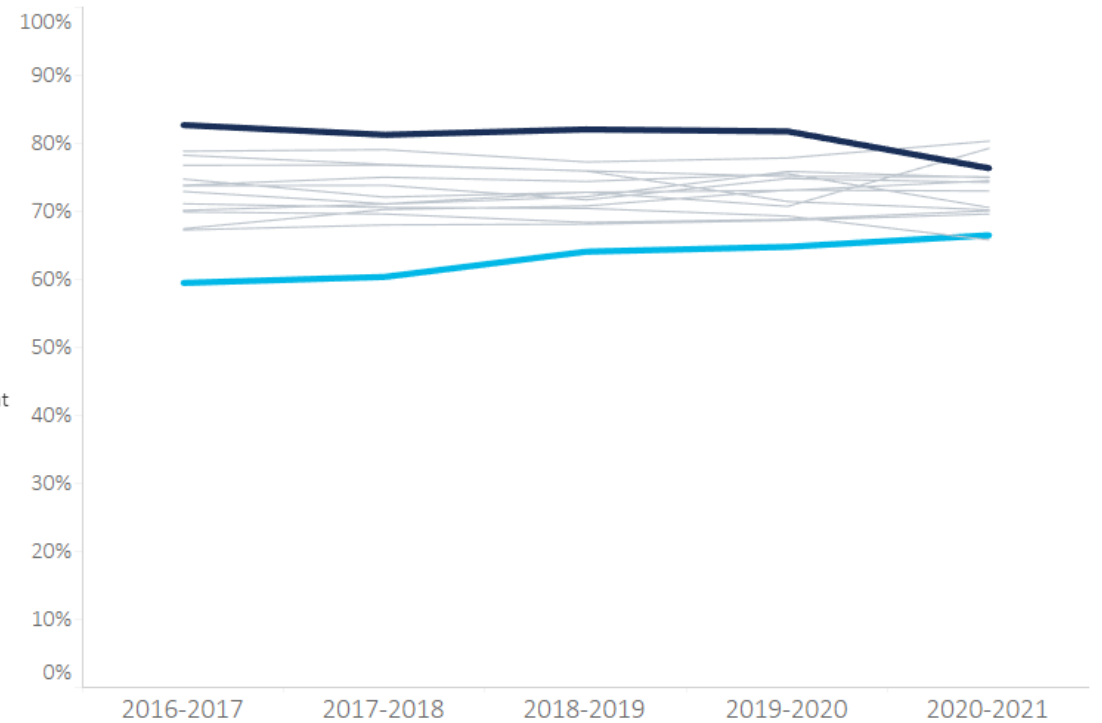
Course success is **increasing in Math** while **decreasing in Communication**

2016-2017 through 2020-2021



Course success is **increasing in Math** while **decreasing in Communication**

2016-2017 through 2020-2021

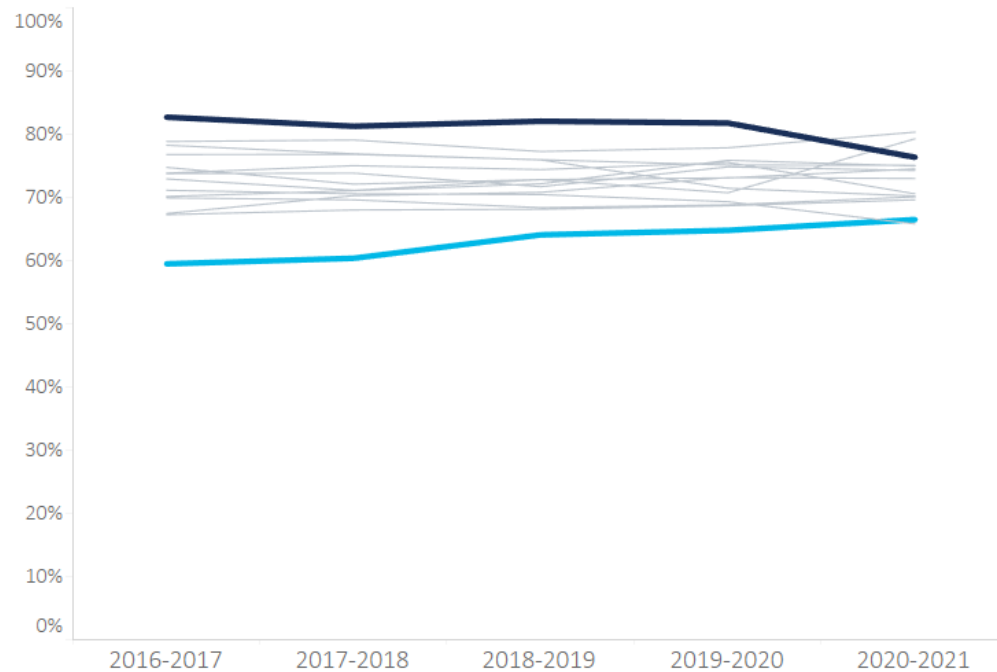


MAKE COLOR MEANINGFUL

Keep color consistent so your user isn't confused

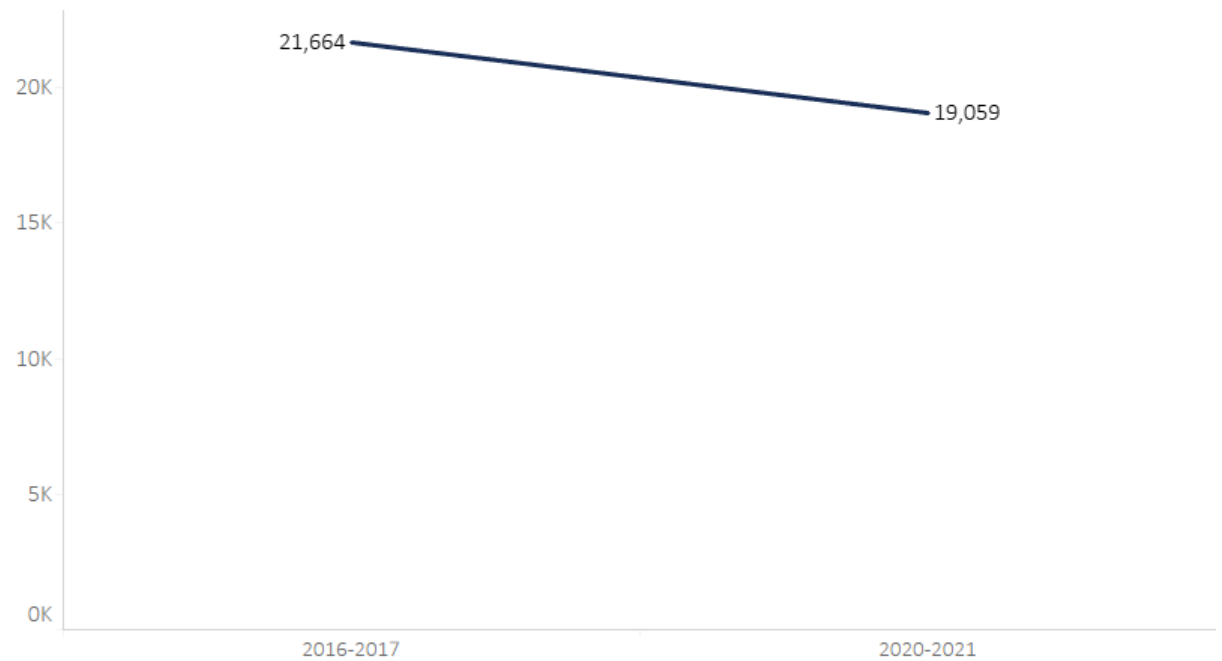
Course success is **increasing in Math** while **decreasing in Communication**

2016-2017 through 2020-2021



Student enrollment is **declining**

2016-2017 through 2020-2021



DESIGN WITH COLORBLIND IN MIND

About 1 in 20 people has a form of colorblindness

Blue is the safest hue



Source: <https://blog.datawrapper.de/colorblindness-part1/>

DESIGN WITH COLORBLIND IN MIND

About 1 in 20 people has a form of colorblindness

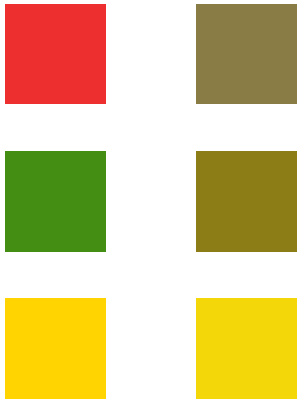


Source: <https://blog.datawrapper.de/colorblindness-part1/>

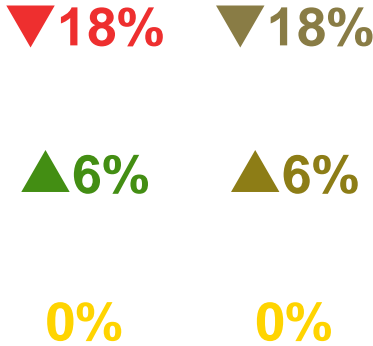
DESIGN WITH COLORBLIND IN MIND

If you use non-colorblind friendly palettes, don't rely on color alone to communicate

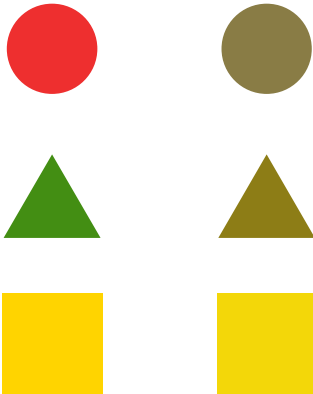
ORIGINAL



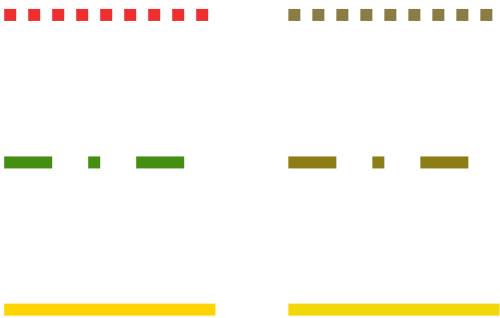
SYMBOLS



SHAPES



LINE STYLES



CONSIDER LEVERAGING SCHOOL COLORS

Identify one or two school colors to use as “look here” colors combined with a neutral




Dark Blue
C:100 M:56 Y:0 K:50
R:26 G:61 B:109
HEX: #0068B6


Blue
C:75 M:5 Y:0 K:0
R:0 G:184 B:231
HEX: #00B8E7

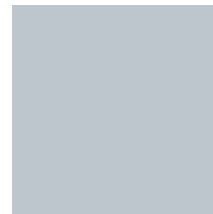

Light Blue
C:19 M:3 Y:3 K:0
R:165 G:214 B:236
HEX: #A5D6EC



Look **here**



Look **here**



Everything else

CHART SELECTION



What are you trying to show?

Select a chart that most clearly gets your message across to your audience

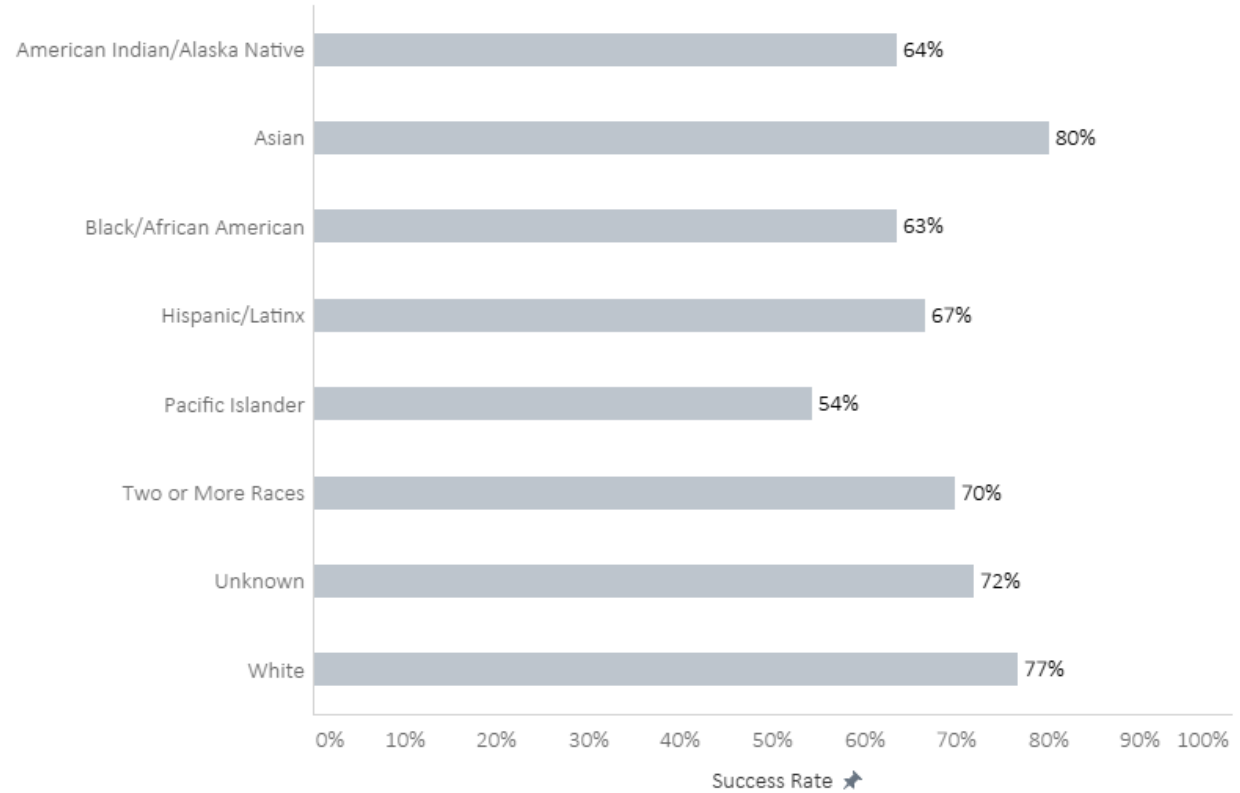
- Compare values
- Show trends
- Highlight key points/insights

Compare Values

- Bar chart
- Dot plot
- Dumbbell chart
- Scatterplot

Course Success Rates by Ethnicity

Fall 2020



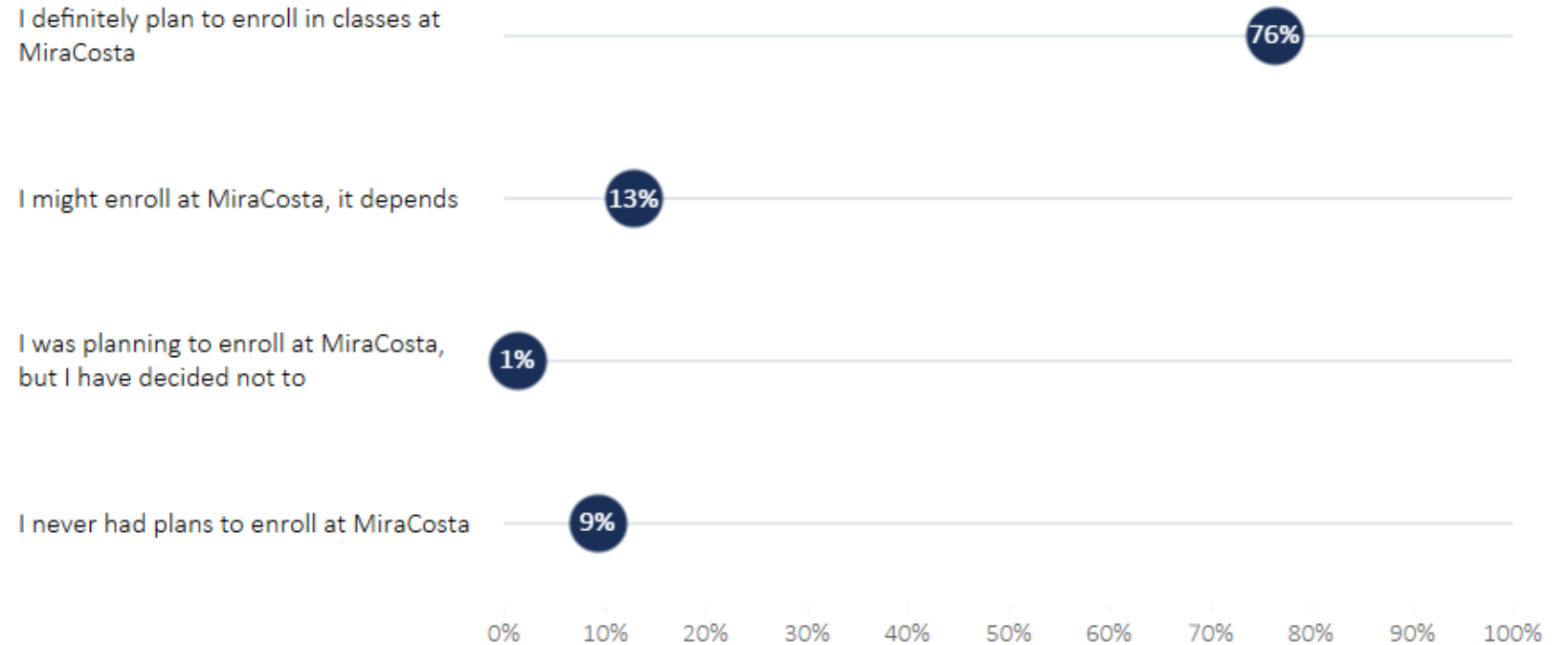
- Start Y axis at 0
- Use horizontal labels
- Variations: bar-in-bar, lollipop, butterfly

Compare Values

- Bar chart
- **Dot plot**
- Dumbbell chart
- Scatterplot

Fall Enrollment Intention

What are your plans for Fall 2021?



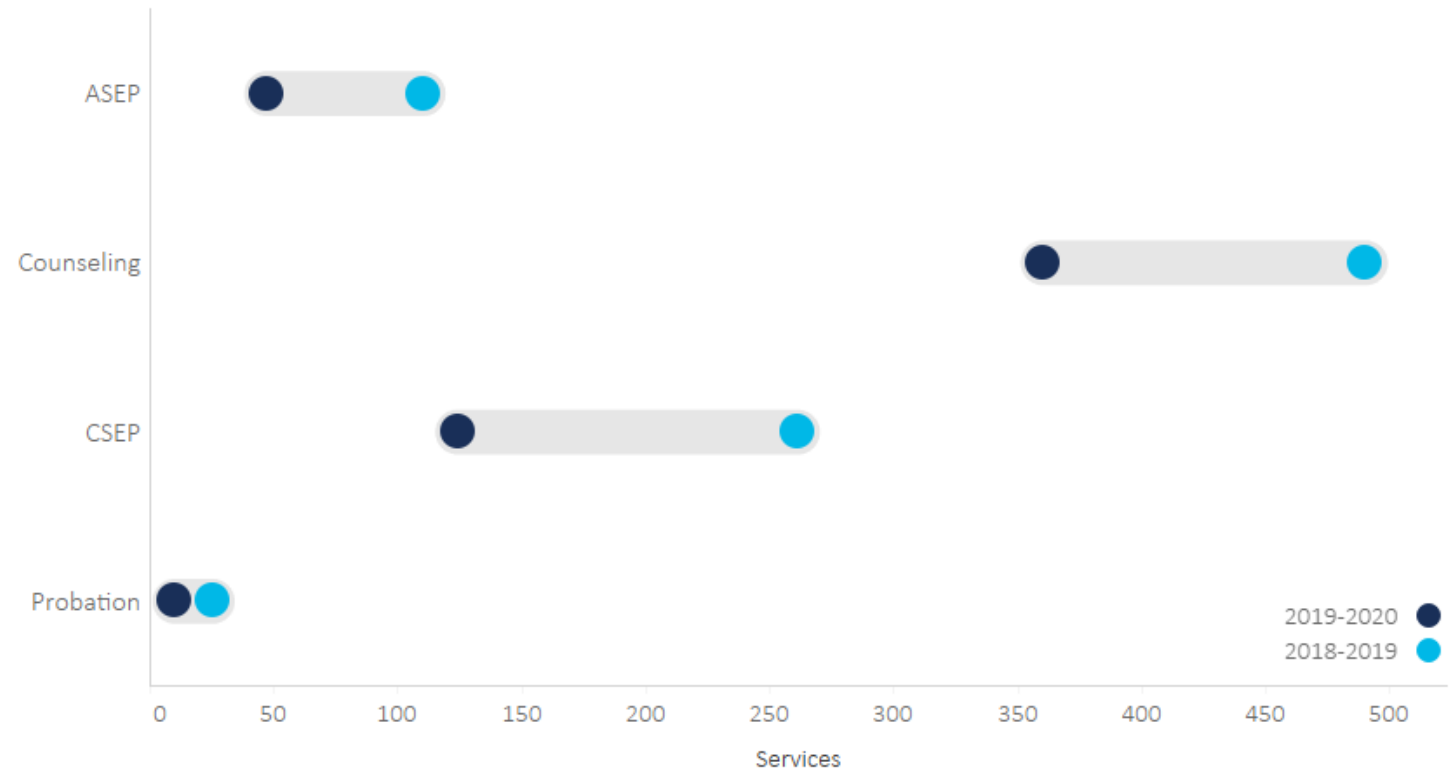
- Leverages position (preattentive attribute)
- Add a line to help orient your user

Compare Values

- Bar chart
- Dot plot
- **Dumbbell chart**
- Scatterplot

Service Breakdown

2019-2020 compared to 2018-2019

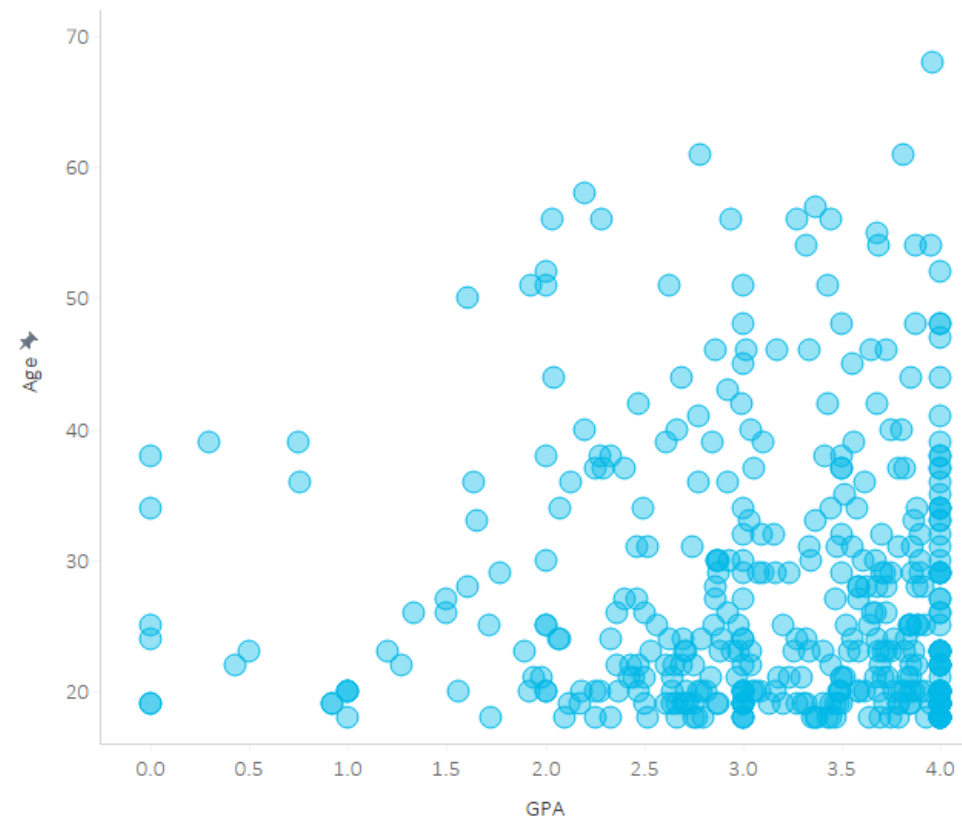


- Best when comparing 2 time points
- Similar data points can get crammed or overlap

Compare Values

- Bar chart
- Dot plot
- Dumbbell chart
- Scatterplot

SAS Students' GPA by Age
Fall 2020



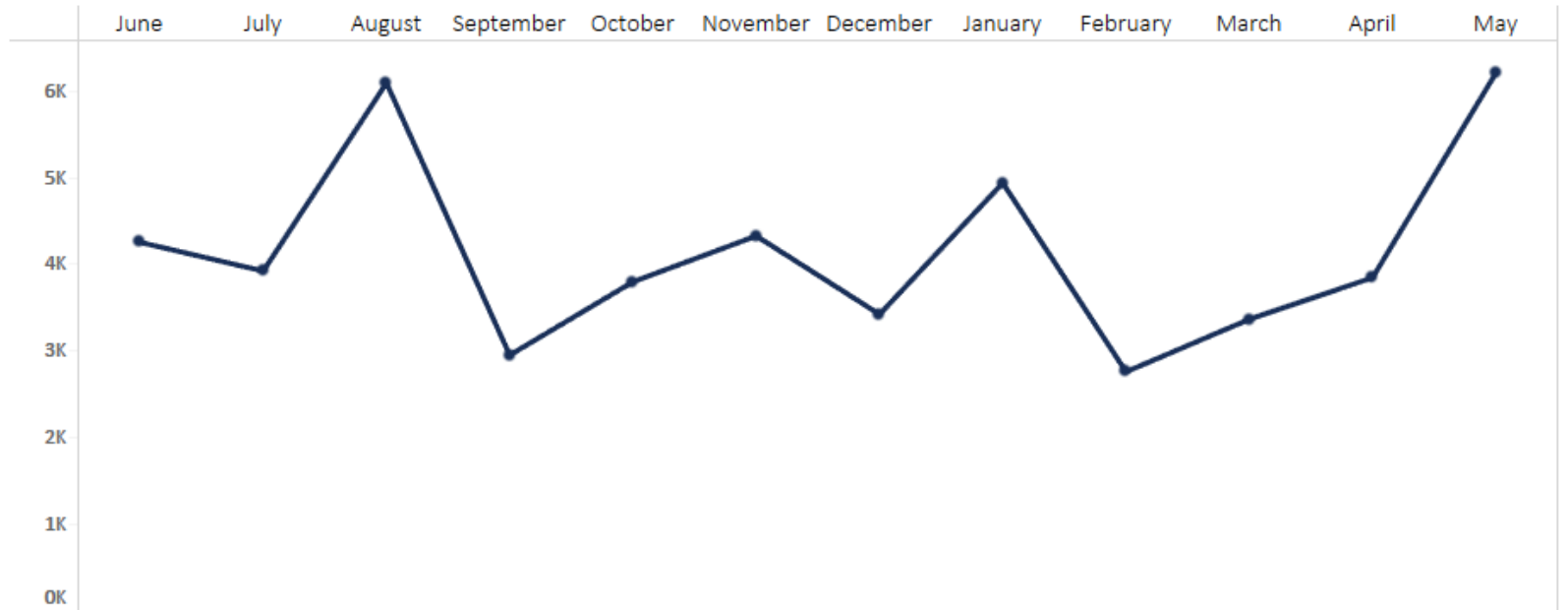
- Compare 2 continuous variables
- Add transparency to points to help users see overlapping points

Show Trends

- Line chart
- Area chart
- Slope chart

Counseling Services by Month

AY 2020-2021



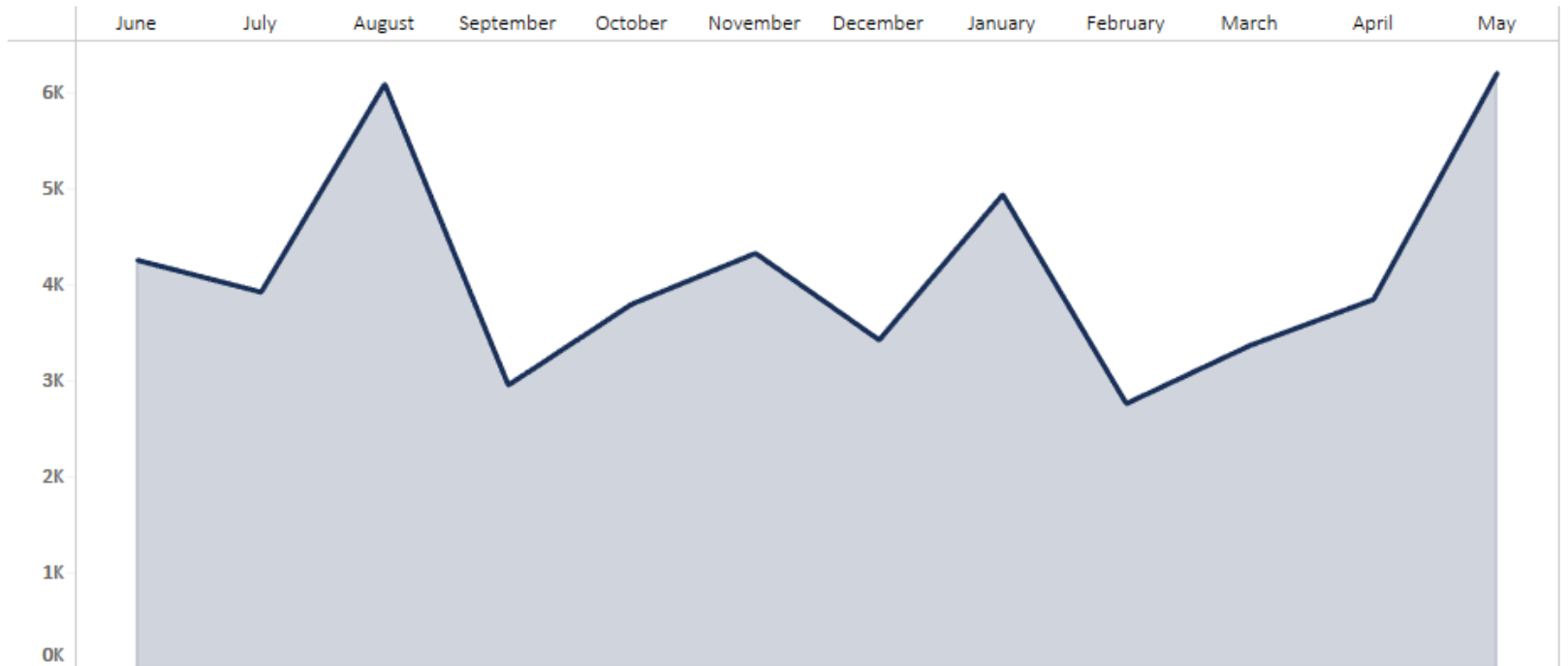
- Show time-series data
- No more than 4 lines

Show Trends

- Line chart
- Area chart
- Slope chart

Counseling Services by Month

AY 2020-2021

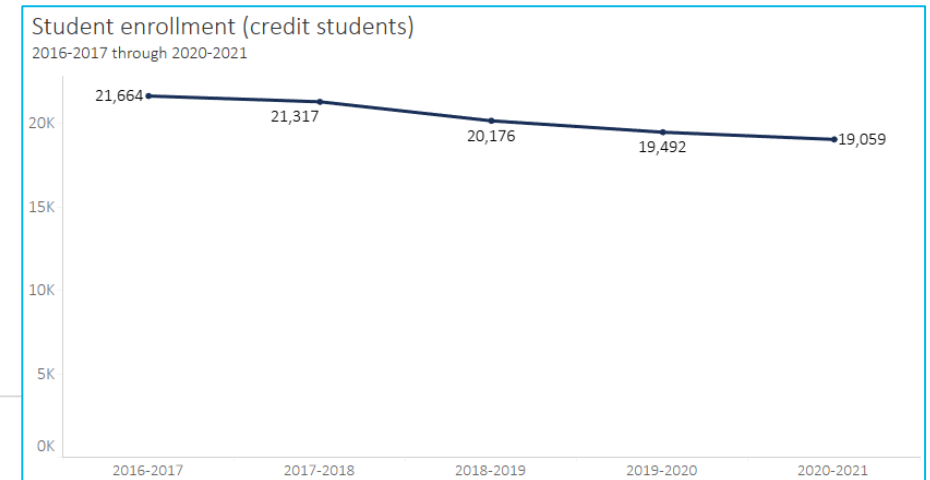
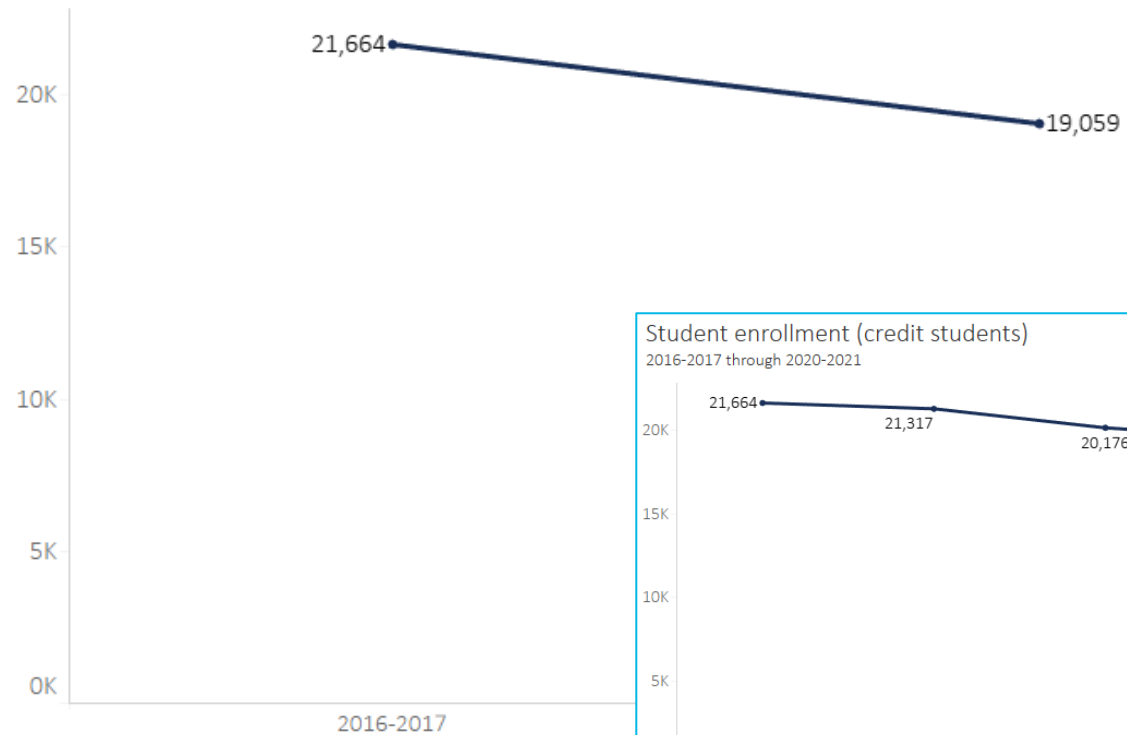


- Show time-series data
- Add transparency
- Don't stack

Show Trends

- Line chart
- Area chart
- Slope chart

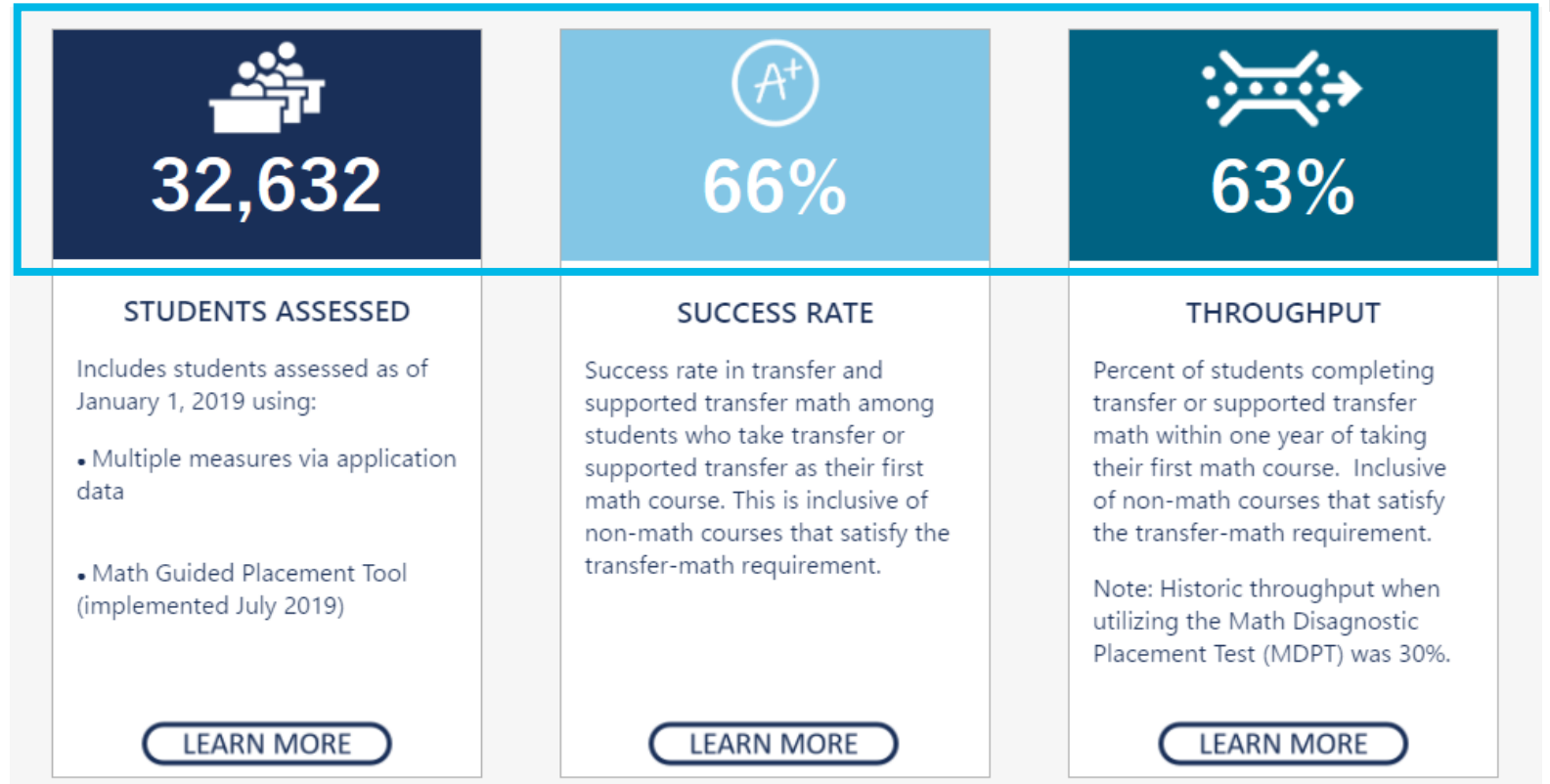
Student enrollment (credit students)
2016-2017 and 2020-2021



- Show relative increases/decreases between 2 time points
- If removing time points between start and end dates, ensure those time points all trend the same directions

Highlight Key Points

- BAN (Big Attention Number)
- Heat map
- Highlight table



- Main takeaways
- Use with icons, symbols (▲▼), spark lines, plain text

Highlight Key Points

- BAN (Big Attention Number)
- Heat map
- Highlight table

October 2019

SUN	MON	TUE	WED	THU	FRI	SAT
		205	143	264	101	227
7	158	271	231	168	116	112
18	196	257	221	456	101	67
15	205	160	196	267	120	95
29	195	229	239	144		

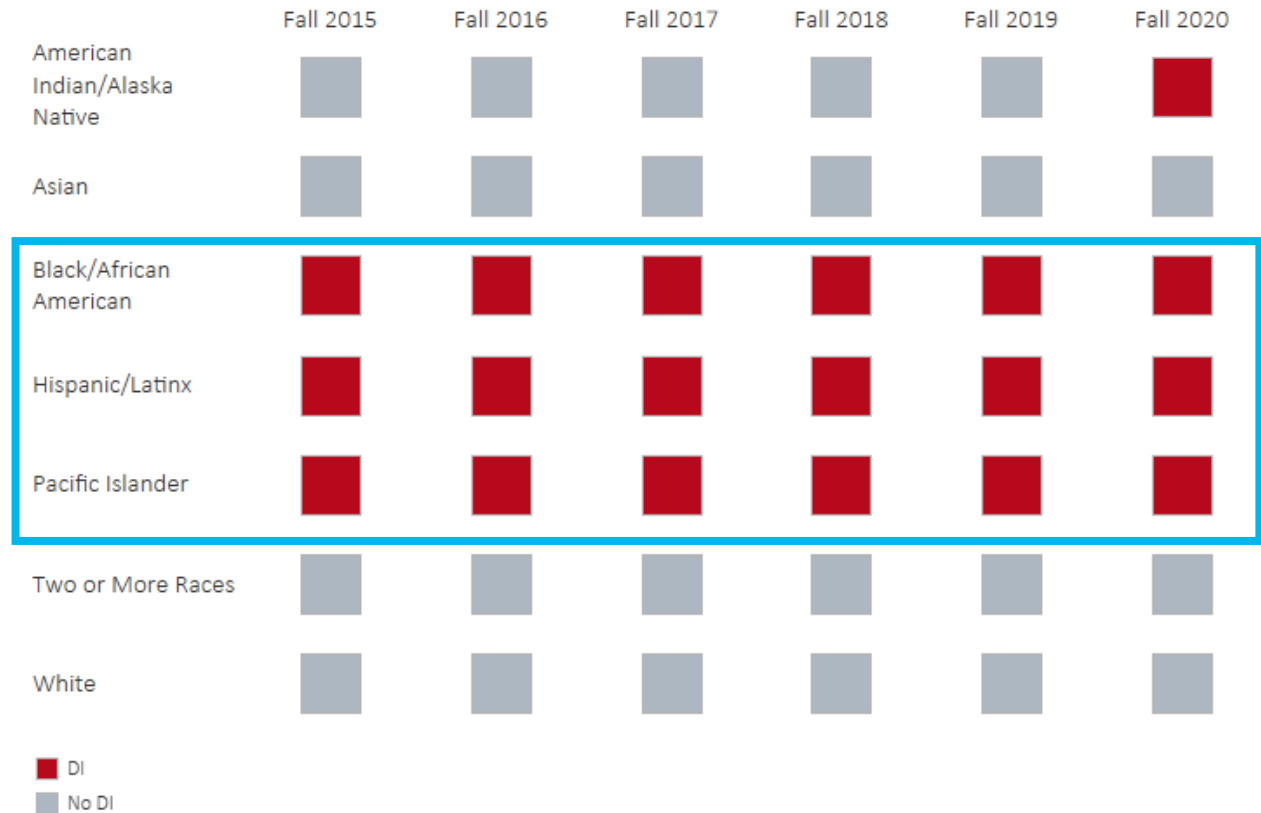
- Leverage color to convey magnitude of a number
- Use with sequential and diverging color palettes

Highlight Key Points

- BAN (Big Attention Number)
- Heat map
- Highlight table

Disproportionate Impact (DI) - Course Success Rates

Fall terms



- Leverage color to quickly identify points of interest
- Typically used to enhance crosstabs

Charts to Avoid

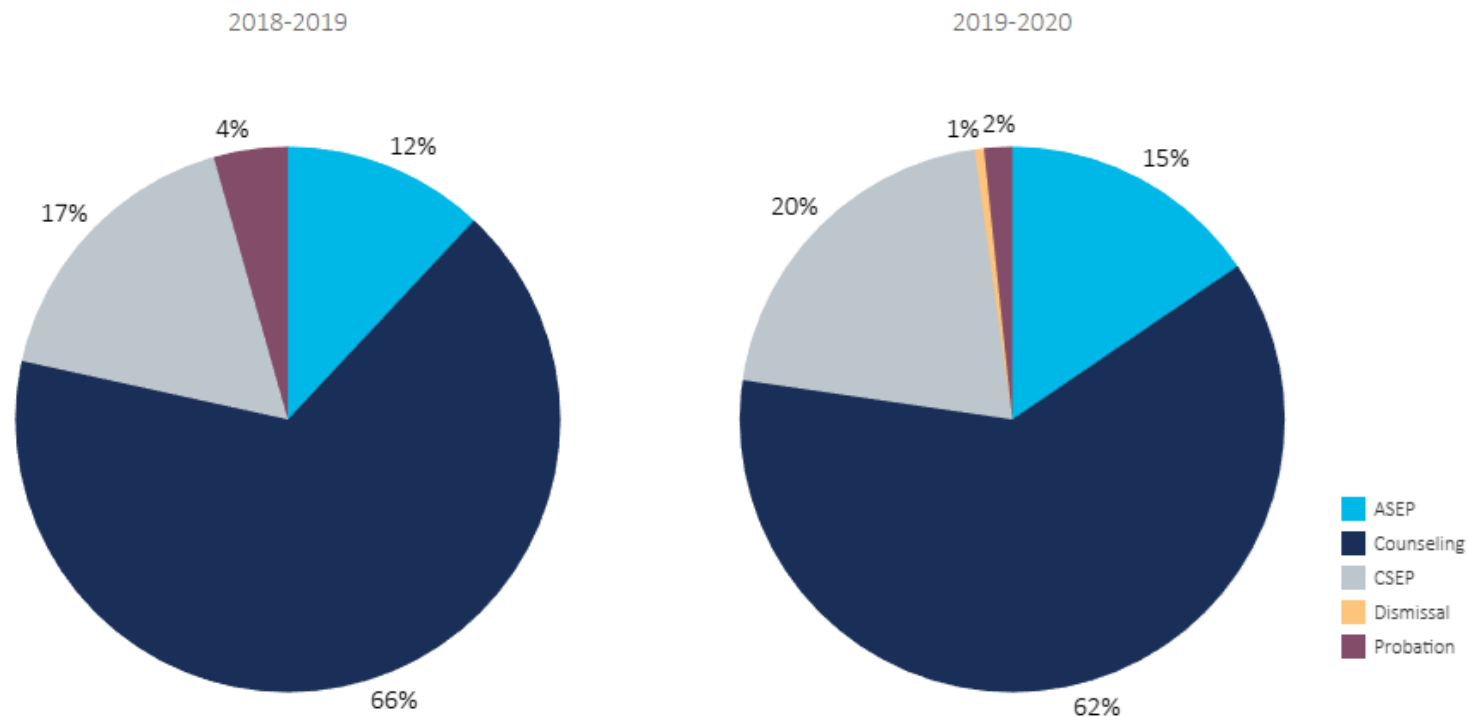
- Pie/Donut charts
- Stacked bar (and area) charts
- Uncommon/complex charts

AVOID: PIE/DONUT CHARTS

We aren't naturally good at comparing angles, arcs, and area of a circle

Service Breakdown

2019-2020 compared to 2018-2019



**If you use a pie chart,
do so responsibly**

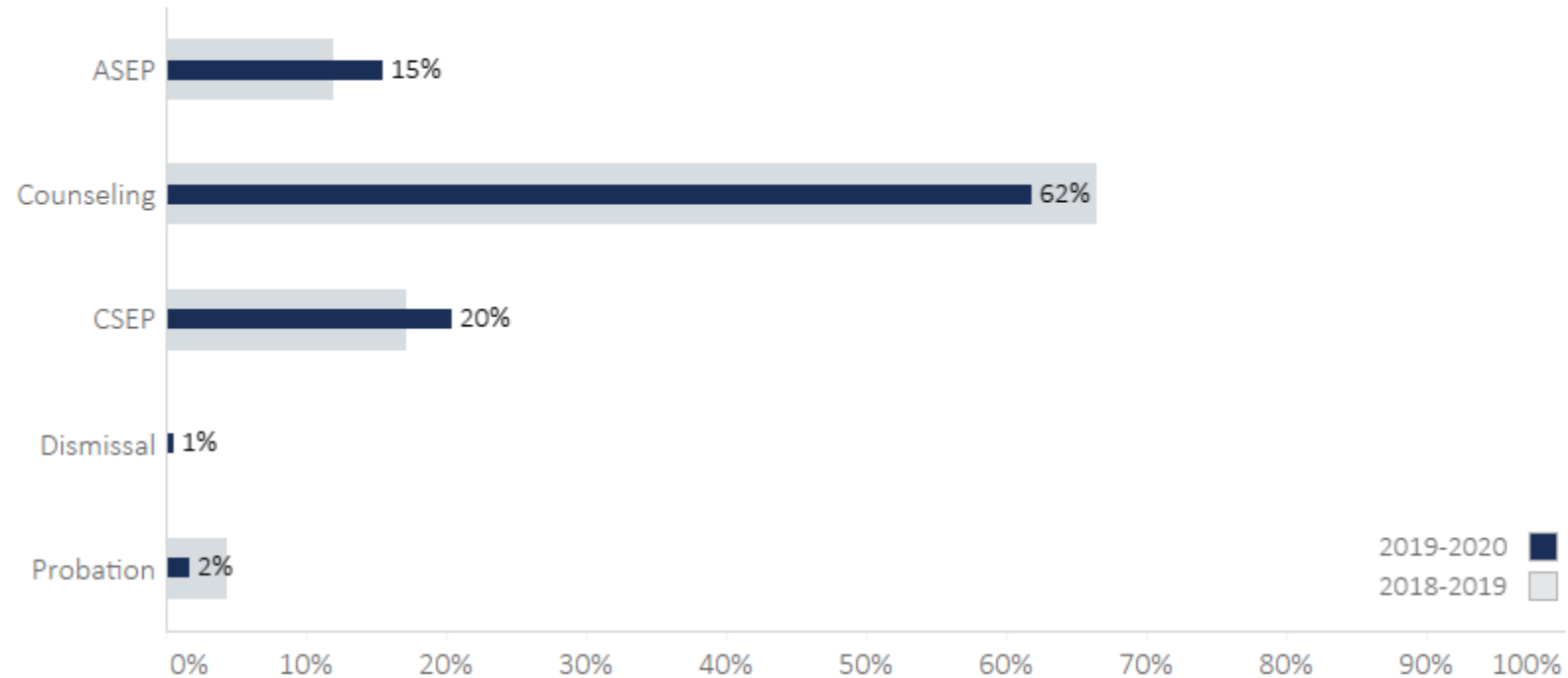
- No more than 3 slices
- Make sure all slices add up to 100%
- Don't use for comparisons

USE INSTEAD OF PIE/DONUT CHARTS

Bar charts

Service Breakdown

2019-2020 compared to 2018-2019

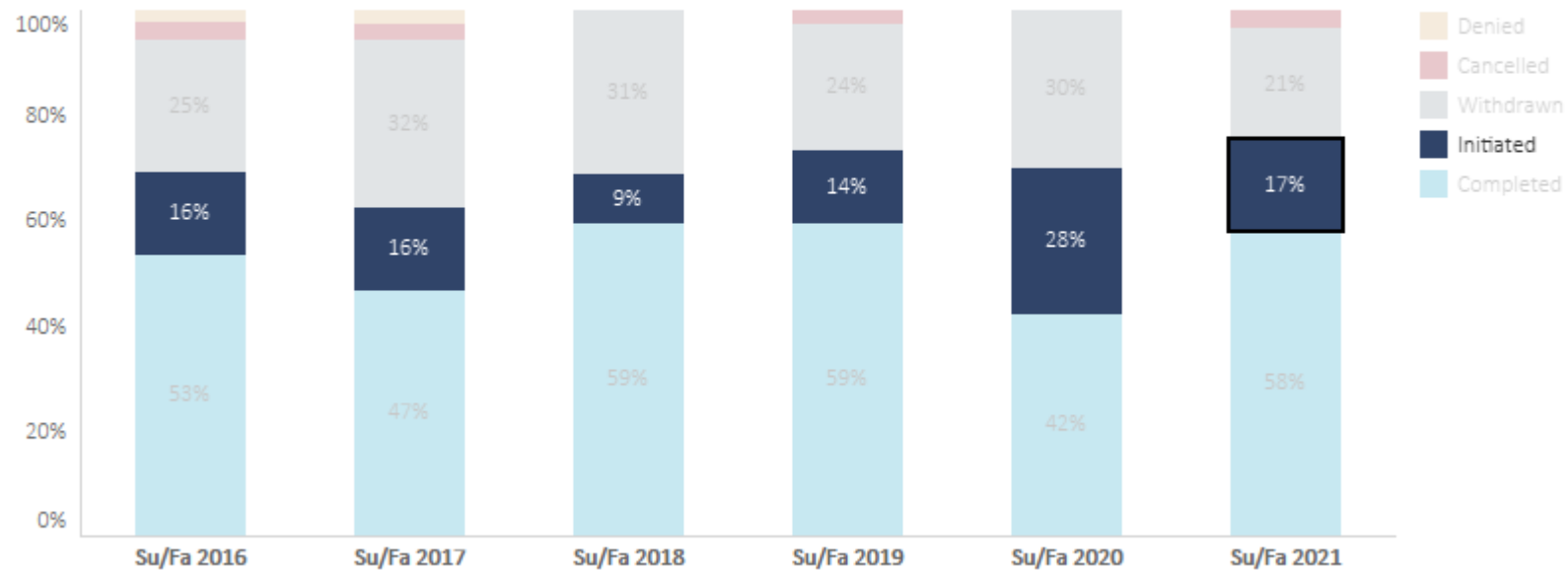


AVOID: STACKED BAR CHARTS

Comparing bars starting at uncommon baselines is difficult

International Student Application Status

Spring semesters

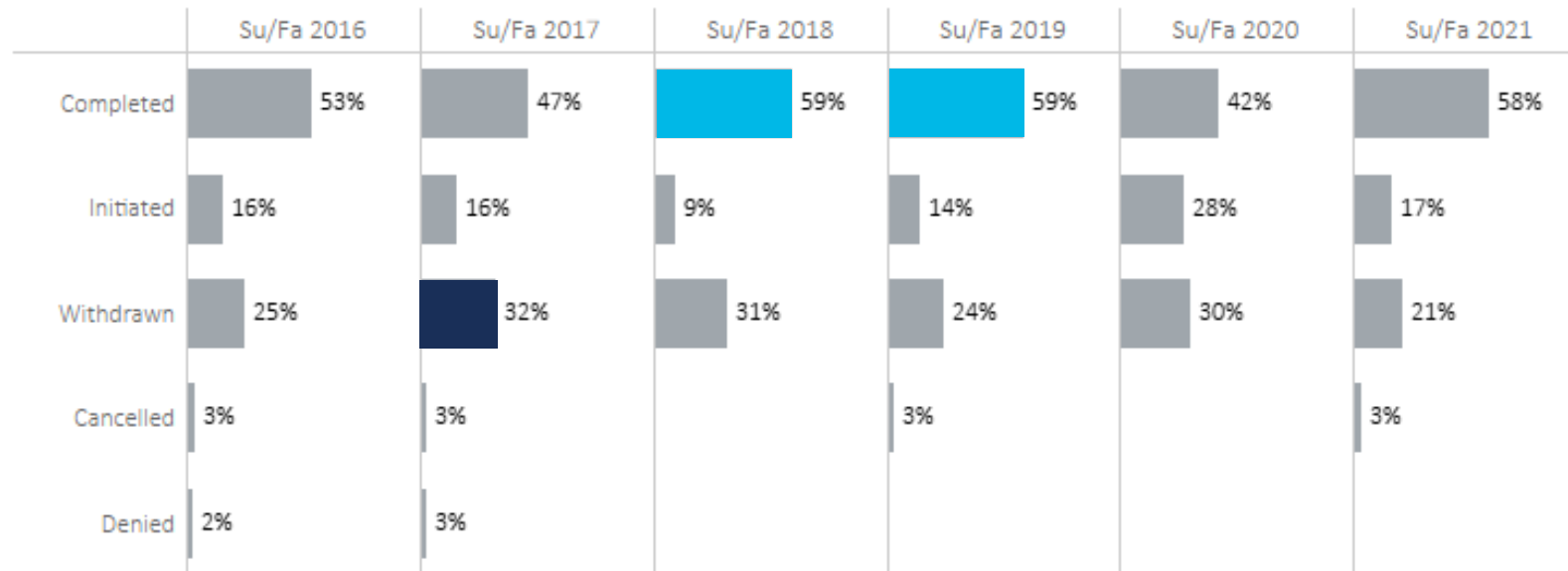


USE INSTEAD OF STACKED BAR CHARTS

Small multiples (bar charts)

International Student Application Status

Spring semesters



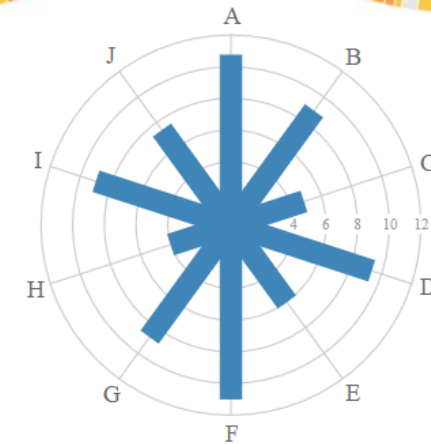
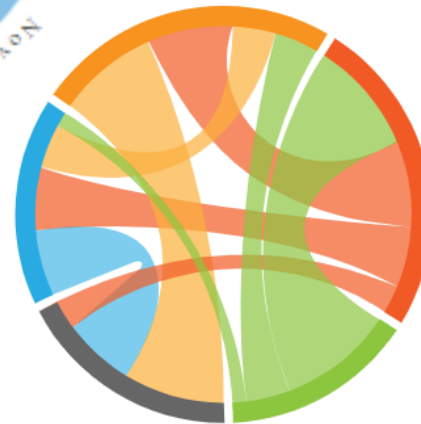
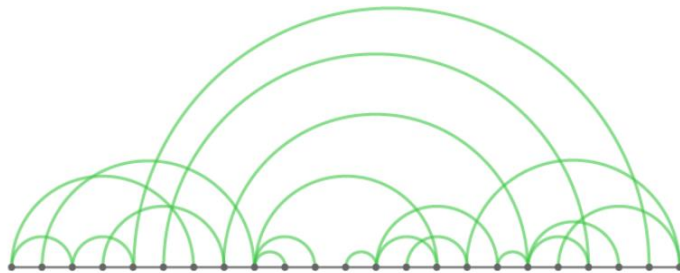
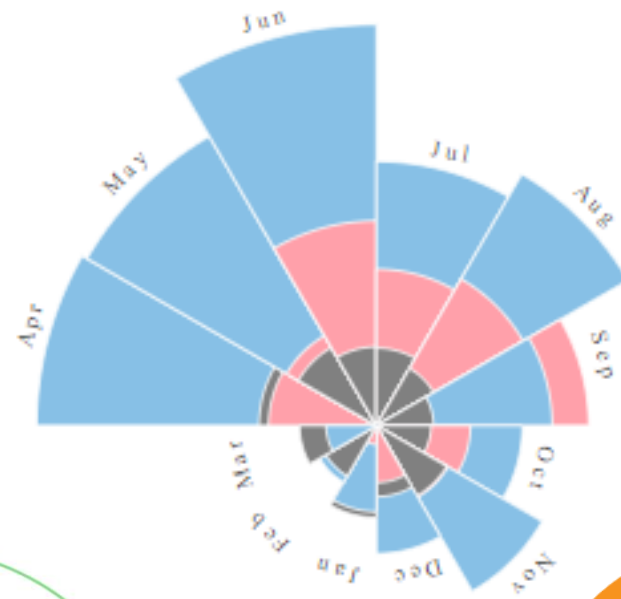
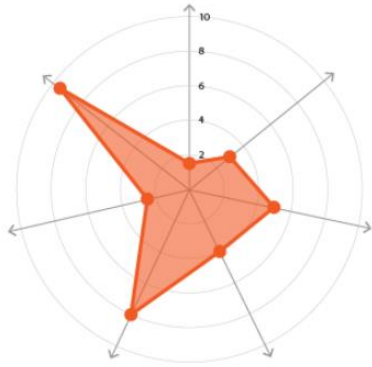
AVOID: UNCOMMON, COMPLEX CHARTS

Users won't take the time to understand them



AVOID: UNCOMMON, COMPLEX CHARTS

Users won't take the time to understand them



Source: <https://datavizcatalogue.com/>

CLUTTER



A large share of the ink on a graphic should present data-information, the ink changing as the data changes. Data-ink is the non-erasable core of a graphic, the non-redundant ink arranged in response to variation in the number represented

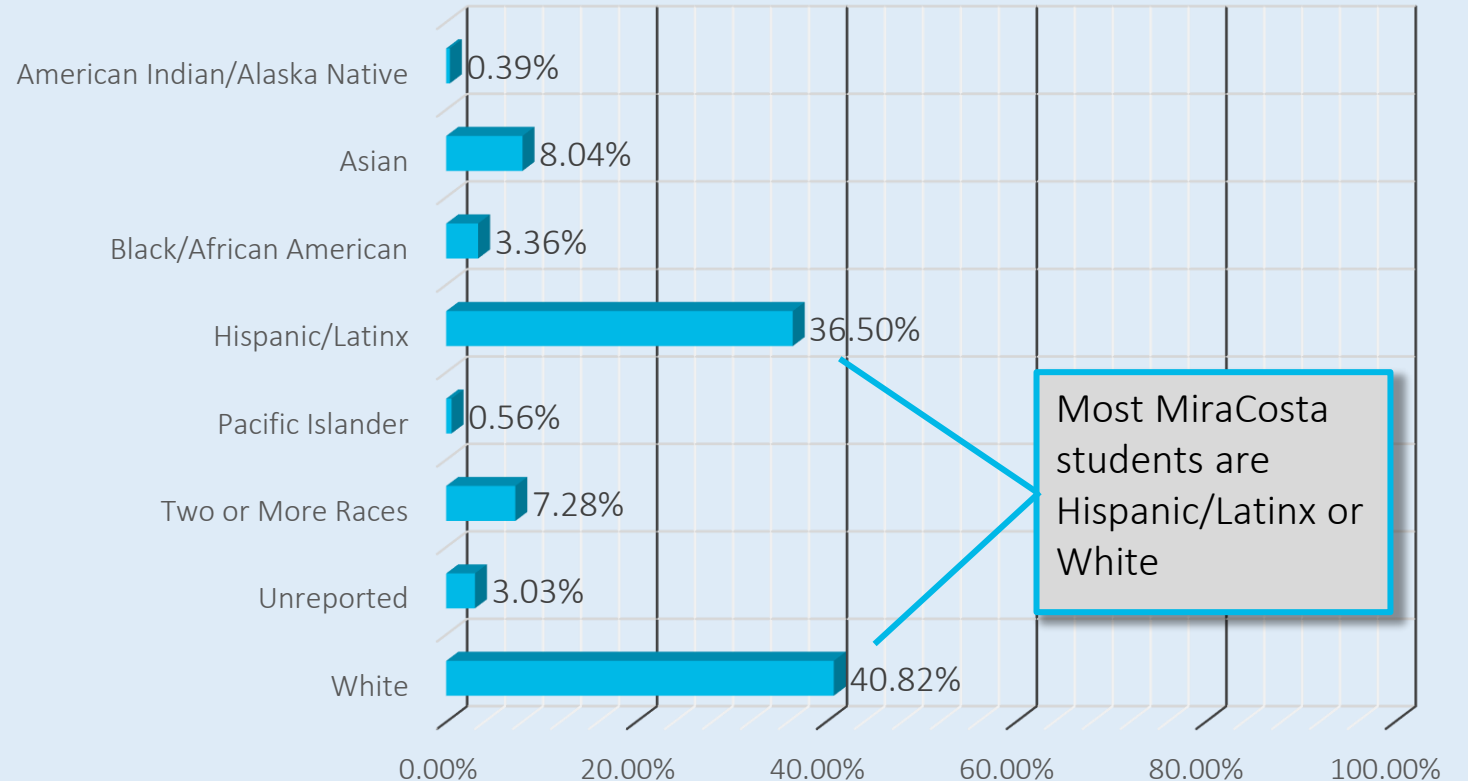
- Edward Tufte

Chartjunk

Anything that takes up space on a visualization, but is not necessary for understanding the chart

Students by ethnicity in Academic Year 2020-2021

Distribution of student ethnicities



1 Redundant Titles

2 3D charts

3 Intense grid lines

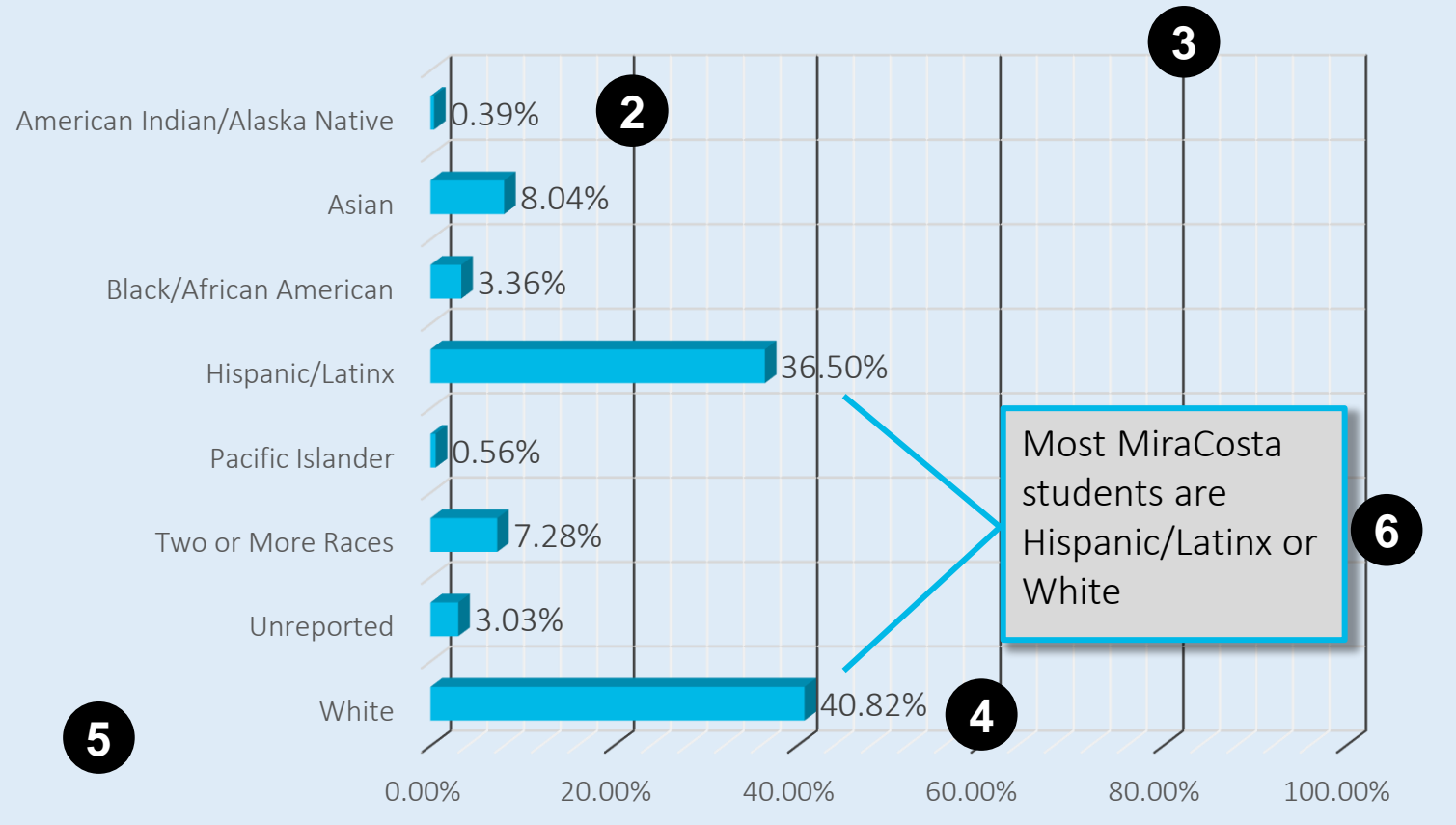
4 Extra decimal places

5 Background color

6 Call out

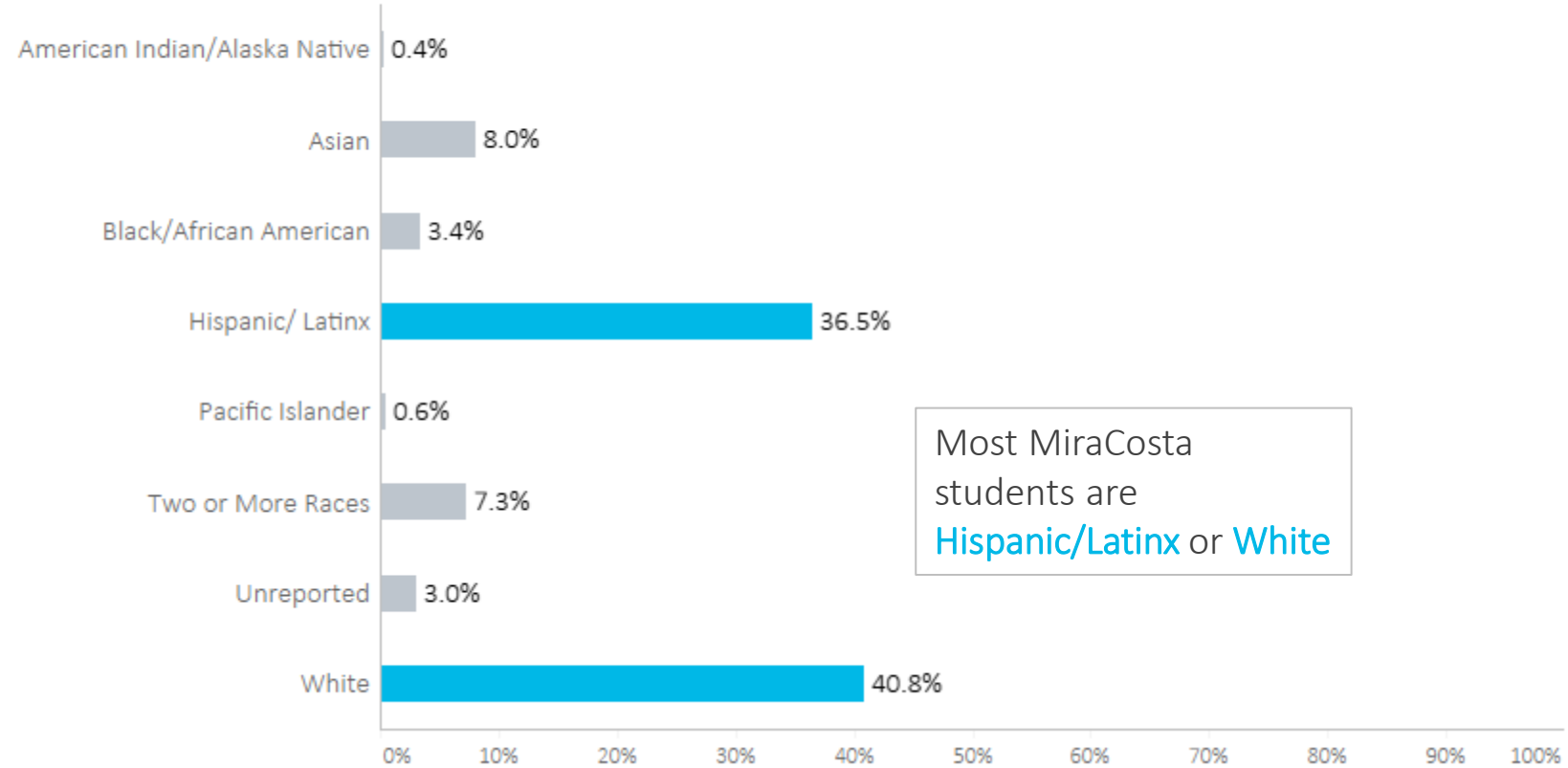
1 Students by ethnicity in Academic Year 2020-2021

Distribution of student ethnicities



Students by Ethnicity

2020-2021



**PUTTING
IT ALL
TOGETHER**





SSSP Cohorts

Select a bar to filter other charts

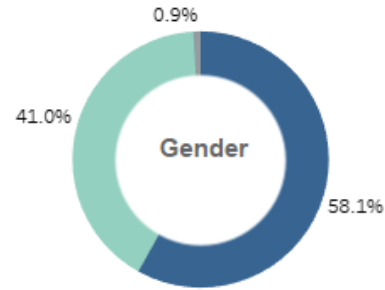
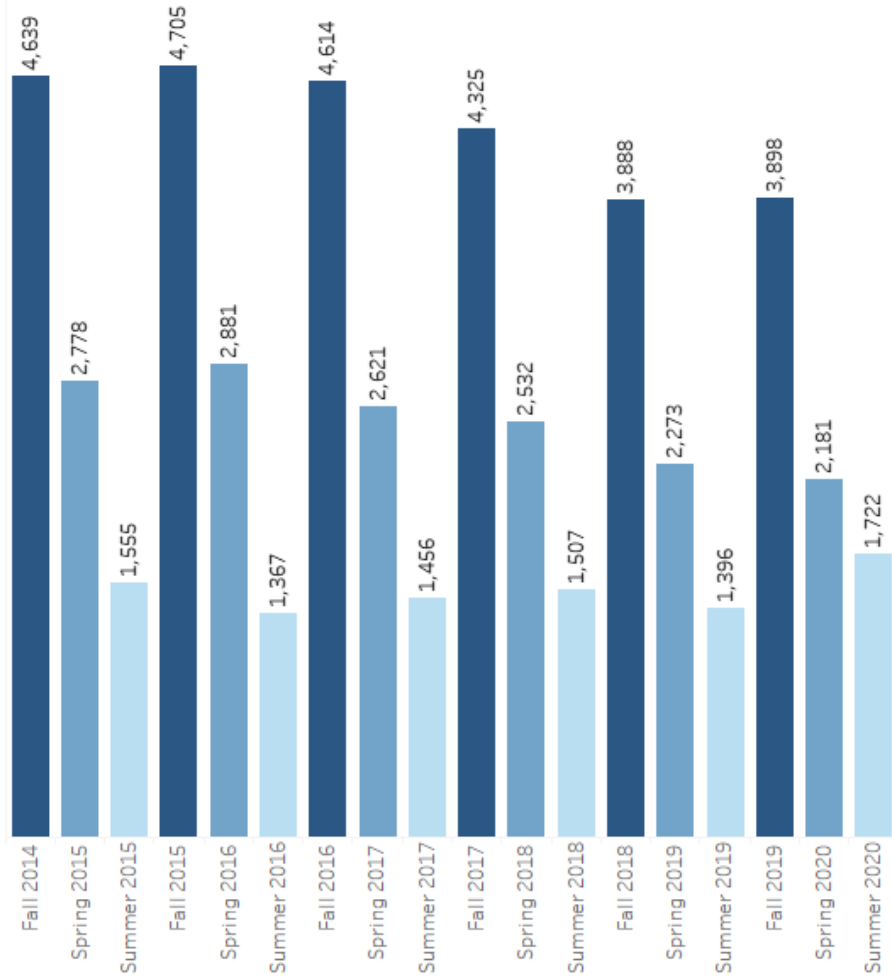
SSSP Cohort Demographics

Education Goal Description

(All)

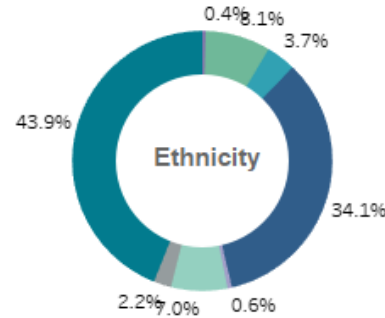
Admit Type Description

(All)



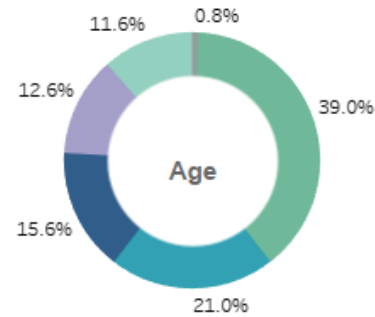
Gender

- Female
- Male
- Nonbinary
- Unreported



Ethnicity

- American Indian/Alas..
- Asian
- Black/African American
- Hispanic
- Pacific Islander
- Two or More Races
- Unknown
- White



Age at SSSP Cohort

- 17 and Under
- 18 - 20
- 21 - 24
- 25 - 29
- 30 - 39
- 40 and Older

- 1 Color isn't meaningful
- 2 Too much color
- 3 Not colorblind safe
- 4 Chart selection
- 5 Clutter
- 6 Text alignment

SSSP Cohorts include first-time students to MiraCosta College. Students must be enrolled in at least 1 credit course. Students may enter a new cohort if they return to MiraCosta after 6 consecutive terms (including summers) of non-enrollment.



SSSP COHORT OVERVIEW

Key Performance Indicators (KPI)

COHORT | Fall 2020



STUDENT COUNT

3,332

ORIENTATION

67%

MATRICULATION

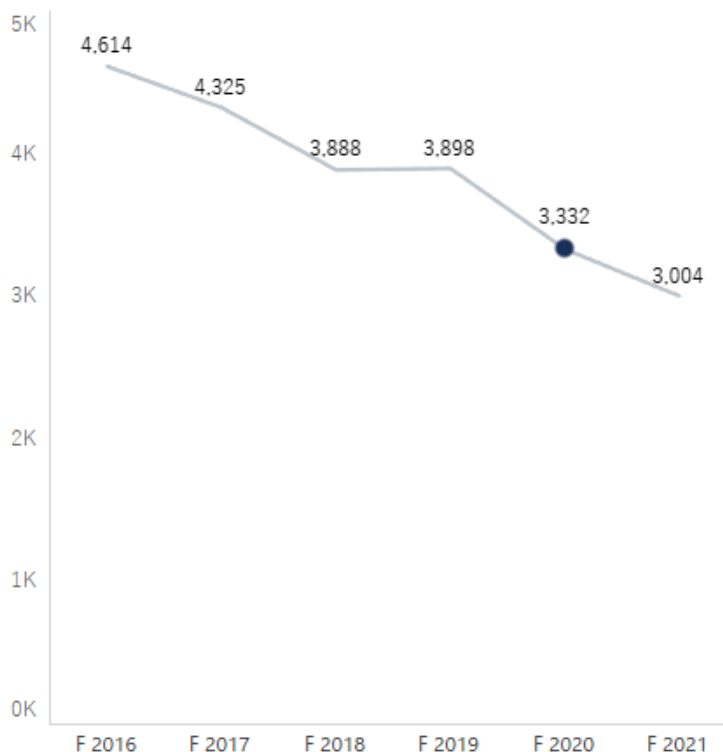
64%

ED PLANS

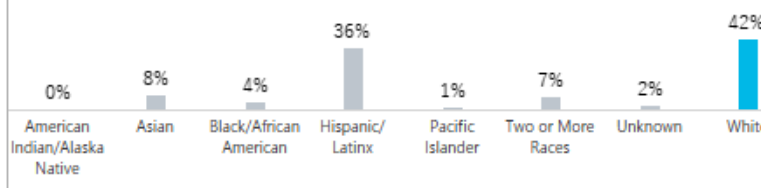
16%

STUDENT COUNT | by Fall cohorts

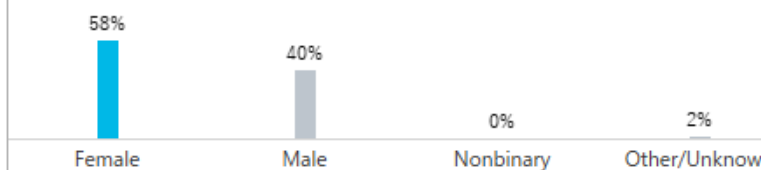
● Selected cohort



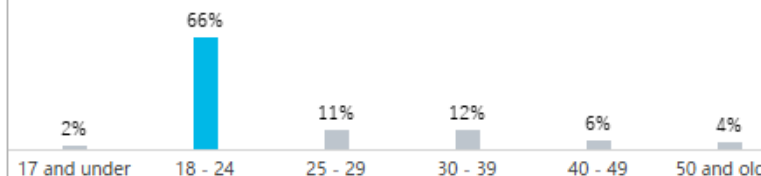
ETHNICITY | Fall 2020 cohort



GENDER | Fall 2020 cohort



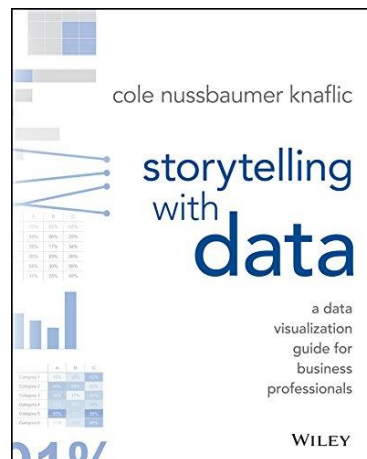
AGE | Fall 2020 cohort



RESOURCES

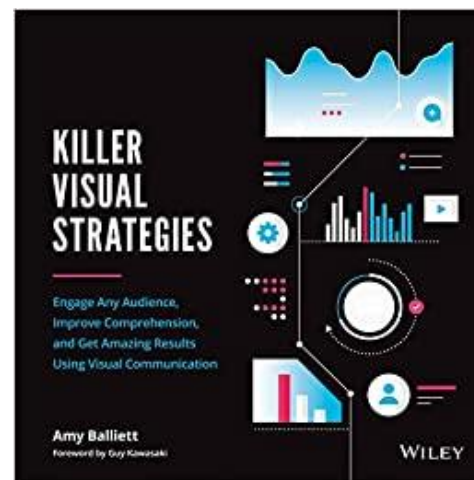
Storytelling with Data

Cole Nussbaum Knaflic



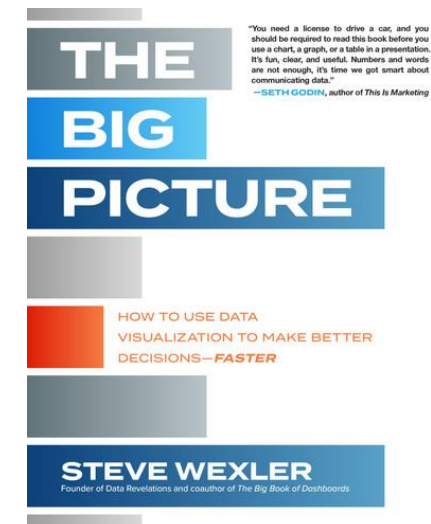
Killer Visual Strategies

Amy Balliett



The Big Picture

Steve Wexler



RESOURCES



Colorblind Palette Checker | <https://davidmathlogic.com/colorblind/>

Coblis – Colorblind Simulator | <https://www.color-blindness.com/coblis-color-blindness-simulator/>

Using Color Effectively | <https://blog.datawrapper.de/beautifulcolors/>



From Data to Viz | <https://www.data-to-viz.com/>

Data Viz Project | <https://datavizproject.com/>

Question to ask when creating charts | <https://blog.datawrapper.de/better-charts/>

Questions?

Lisa Trescott | ltrescott@miracosta.edu