

# Empowering Insights: Data Storytelling with Tableau

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Illinois State University

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Image inspired by Nelson, Ronka, & Lang, *Designing & Leading Life-changing Workshops*.

“Creativity is seeing something  
that doesn't exist already.”

# Data storytelling can solve common organizational problems

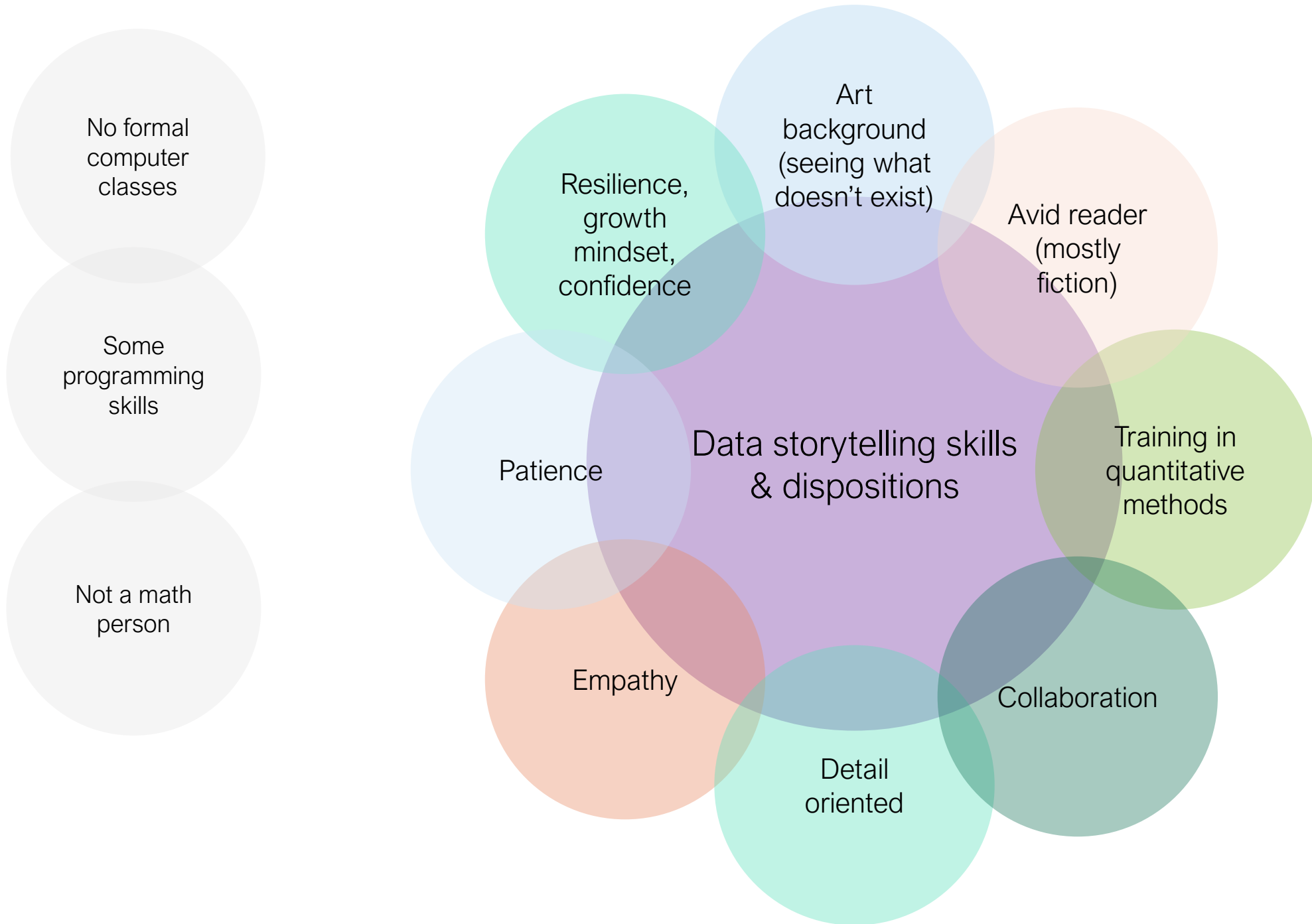
The amount of data we have *far exceeds* our capacity to use it.

Non-technical audiences struggle engaging with data.

Important trends get buried.

Silos. Puzzle pieces. Islands.

Equity & inclusion – capturing voices.



# What we will be doing today

1. Defining data storytelling.
2. Presenting two types of dashboards.
3. Storybuilding.
4. Cases.
5. Practical tips.
6. Exercises in Tableau.

# Reflection: Your Data Storytelling Story

Data storytelling is the practice of creating a compelling narrative **based on evidence** to educate, influence, and **inspire action**.

1. Data
2. Visualization
3. Narrative

# Data

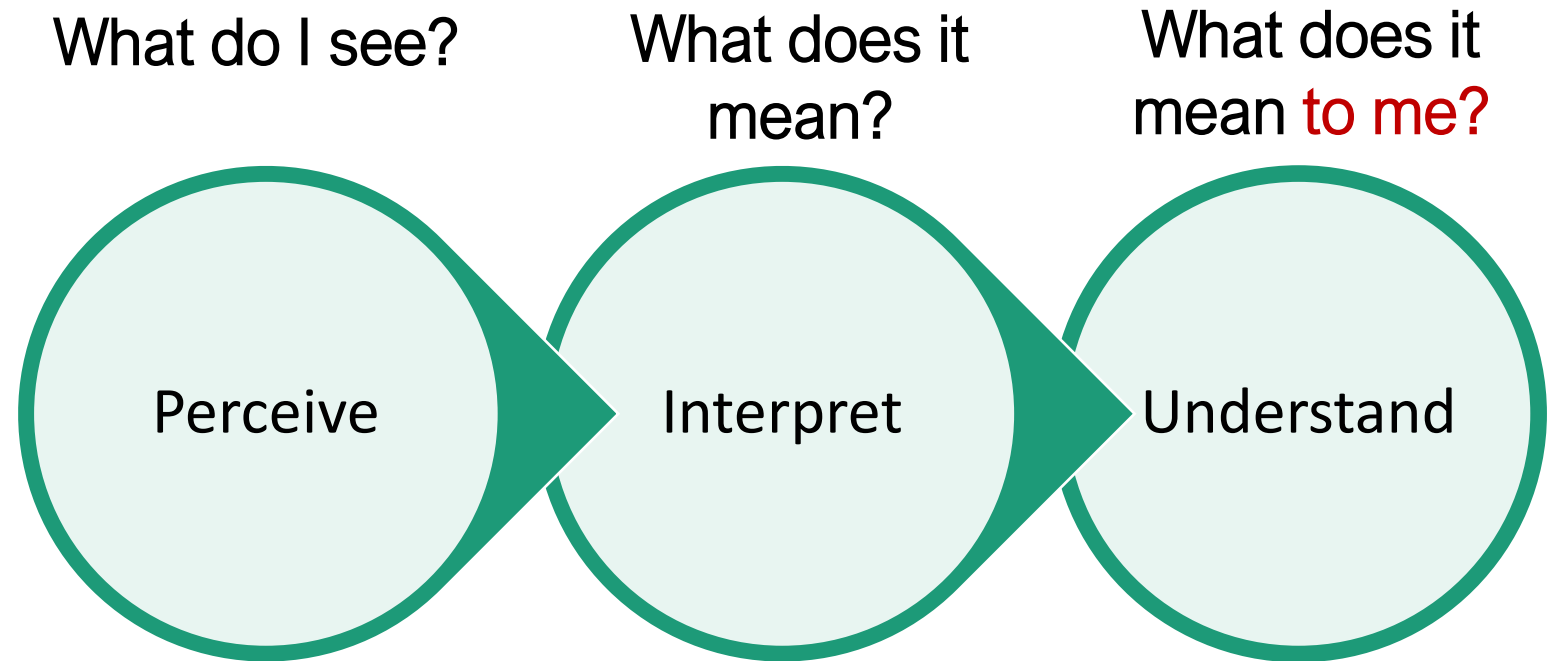
100																							
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	
Start Date	End Date	Status	IP Address	Progress	Duration (	Finished	Recorded Date	Response	Recipient	Recipient	Recipient	External C	Location L	Location L	Distributi	User Lang	Q3	Q4#1_1	Q4#1_2	Q4#1_3	Q4#1_4	Q4#1_5	
Start Date	End Date	Response	IP Address	Progress	Duration (	Finished	Recorded Date	Response	Recipient	Recipient	Recipient	External C	Location L	Location L	Distributi	User Lang	What are	For each c	For each c	For each c	For each c	For each c	
["ImportId": "start", "ImportId": "end", "ImportId": "ImportId", "ImportId", "ImportId", "ImportId", "ImportId", "ImportId", "ImportId", "ImportId", "ImportId", "ImportId", "ImportId", "ImportId", "ImportId", "ImportId", "ImportId", "ImportId", "ImportId", "ImportId", "ImportId", "ImportId"]																							
11/2/2022 14:17	11/2/2022 14:17	1			37	1	11/2/2022 14:17	R_1r6B96IECneykKK								review	EN						
11/3/2022 10:54	11/3/2022 10:57	0			139	1	11/3/2022 10:57	R_1rfa5TL74jFSHhe								mail	EN						
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11/3/2022 10:55	11/3/2022 10:57	0			132	1	11/3/2022 10:57	R_2aePL5zrS8vEkHD								mail	EN		4	4	4	4	2
11/3/2022 10:58	11/3/2022 10:58	0			21	1	11/3/2022 10:58	R_OfMuWyrOyJzuaFb								mail	EN						
11/3/2022 10:57	11/3/2022 10:59	0			115	1	11/3/2022 10:59	R_1DorzPQCxG7Lkp1								mail	EN	Basic writ	4	4	4	3	3
11/3/2022 10:55	11/3/2022 11:00	0			335	1	11/3/2022 11:00	R_C90UMf2jzhTzd3r								mail	EN	BASICS!					
11/3/2022 10:56	11/3/2022 11:02	0			360	1	11/3/2022 11:02	R_2CCkxOBtelp7QJ		null						mail	EN	Please	4	4	1	4	1
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11/3/2022 11:01	11/3/2022 11:05	0																					
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11/3/2022 11:00	11/3/2022 11:05	0			325	1	11/3/2022 11:05	R_2ubHc3Uaz6cOp65								mail	EN	developi ng a clear					
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																	Knowing how to research to find the right resource s for their writing						

## Cleaned data

▲	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		21	22	23	24	25	26	27	28	29	30	31	32	33		34
2	1	2024	2	4	4	4	3	1	4	3	2	3	4	4	4	7	3	1		The campus environment is welcoming and inclusive.	0	4	1	4	0	0	0	1	0	0	0	4			3.14	
3	2	2024	3	5	5	5	5	1	2	4	3	2	1	4	4	6	6	4			0	3	1	5	0	0	1	1	0	0	0	1	8		3.61	
4	3	2024	4	5	4	5	1	3	4	3	1	3	1	4	1	1	3	7	5	I have had a great experience with the faculty and feel supported.	0	2	4	1	0	0	0	0	0	0	1	0	7		3.52	
5	4	2024	4	4	4	2	5	4	2	1	1	2	2	1	1	4	9	6	3		0	3	1	4	0	0	0	0	0	0	1	0	7		2.31	
6	5	2024	3	4	5	5	3	4	3	4	2	2	2	1	4	4	4	3	1		1	2	1	3	0	0	0	0	0	0	1	0	7		2.3	
7	6	2024	2	3	4	4	5	4	2	3	2	1	1	2	3	1	5	9	3		1	3	4	6	0	0	0	0	0	0	0	0	9		2.54	
8	7	2024	1	1	3	4	3	4	4	4	3	2	1	4	2	1	3	4	9		1	3	2	7	0	0	0	0	0	0	0	0	9		2.72	
9	8	2024	4	2	5	3	5	1	4	2	1	4	4	3	4	1	8	2	2		0	2	4	1	0	0	0	0	0	0	0	0	9		2.82	
10	9	2024	4	3	3	5	5	4	2	2	1	2	3	1	4	3	7	9	1		0	4	1	4	0	0	0	0	0	0	1	0	7		3.36	
11	10	2024	2	5	5	1	3	3	1	4	3	2	3	4	4	3	7	3	7	I appreciate the effort of staff in making resources available.	0	3	2	1	0	0	0	0	1	0	0	0	5		2.11	
12	11	2024	4	1	4	1	5	3	4	4	2	2	1	2	1	2	8	6	7		1	4	1	3	0	0	0	0	0	0	1	0	7		2.07	
13	12	2024	4	1	4	2	4	3	1	1	4	1	2	4	3	4	7	5	5		0	1	1	1	0	0	0	0	0	0	1	0	7		2.78	
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16	15	2024	1	1	3	2	2	1	1	2	1	1	2	1	4	4	2	9	5		1	3	3	4	0	0	0	0	0	0	1	0	7		3.28	
17	16	2024	1	5	4	5	4	2	4	3	2	4	4	2	4	4	1	3	10	The campus environment is welcoming and inclusive.	1	1	2	2	0	0	0	0	0	0	0	1	8		2.52	
18	17	2024	4	3	2	3	2	4	4	2	4	3	2	3	1	5	7	4		1	4	2	5	0	0	0	0	0	0	0	0	9		3.77		
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20	19	2024	3	4	5	4	3	1	4	4	2	3	2	2	2	4	2	9	5		0	1	1	1	0	0	0	0	0	0	1	0	7		2.59	
21	20	2024	4	3	2	5	3	4	1	2	4	4	1	3	3	1	1	10	10	I have had a great experience with the faculty and feel supported.	1	4	3	5	0	0	1	0	0	0	0	1	8		2.46	
22	21	2024	1	4	3	3	1	2	1	2	3	1	4	3	2	4	3	6	2		0	3	4	1	0	0	0	0	0	0	0	0	9		2.82	
23	22	2024	5	1	2	2	2	1	1	2	1	3	1	4	1	3	6	8	4		1	4	3	3	0	1	0	0	0	0	0	0	2		2.48	
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25	24	2024	5	1	1	5	1	3	3	1	4	4	4	1	2	2	10	3	8		0	1	1	2	0	0	0	0	0	0	1	0	7		3.65	
26	25	2024	5	5	1	5	2	3	4	4	2	1	3	1	1	4	7	6	3		0	1	2	1	0	0	0	0	0	0	1	0	7		3.35	
27	26	2024	5	3	4	3	3	1	4	1	2	3	3	1	3	1	7	5	8		0	3	1	2	0	0	0	0	1	0	1	0	8		3.65	
28	27	2024	4	4	5	3	2	1	1	2	4	4	3	2	4	1	3	7	2		1	2	4	7	0	0	0	0	0	0	0	0	9		2.79	
29	28	2024	2	5	2	3	5	2	2	2	3	1	3	4	2	1	1	7	3		0	2	4	4	0	0	0	0	0	0	0	0	9		2.31	
30	29	2024	2	2	1	2	1	1	2	2	2	4	3	2	4	3	9	9	5	I have had a great experience with the faculty and feel supported.	0	4	1	4	0	0	0	0	0	0	0	0	9		3.48	
31	30	2024	4	4	5	4	1	3	4	1	1	3	2	4	2	2	5	1	10	I appreciate the effort of staff in making resources available.	1	2	3	4	0	0	0	0	0	0	0	0	9		2.72	
32	31	2024	4	1	4	3	2	3	1	3	3	2	4	2	4	2	2	6	10	I have had a great experience with the faculty and feel supported.	0	4	1	1	0	0	0	0	0	0	1	0	7		3.34	
33	32	2024	3	4	5	4	1	4	3	3	4	1	1	4	4	8	5	8		1	3	3	3	0	0	0	0	0	0	0	0	9		2.54		
34	33	2024	2	2	4	4	3	2	1	4	1	3	1	4	3	2	10	4	1		1	4	2	5	0	0	0	0	0	0	0	0	9		2.16	
35	34	2024	5	4	2	5	1	1	1	1	4	4	2	4	4	1	10	10	4	I appreciate the effort of staff in making resources available.	0	4	4	1	0	0	0	0	0	0	0	0	9		3.99	
36	35	2024	4	5	5	1	2	1	3	3	2	2	1	3	2	3	4	1	1		0	4	3	1	0	0	0	0	0	0	0	0	9		2.31	
37	36	2024	5	4	2	1	3	1	1	4	3	2	1	4	4	1	10	4	1		0	3	2	1	0	0	0	0	0	0	0	1	8		3.98	
38	37	2024	2	3	5	2	3	2	3	2	2	4	1	4	1	1	7	10	5	I have had a great experience with the faculty and feel supported.	1	4	1	3	0	0	0	0	0	0	0	0	9		3.95	
39	38	2024	1	2	4	2	1	3	4	2	2	1	4	2	4	2	5	7	6		1	3	1	7	0	0	0	0	0	0	0	1	8		3.59	
40	39	2024	1	4	4	1	2	1	4	4	3	4	1	1	4	3	3	4	1		0	4	1	1	0	0	1	0	0	0	0	1	8		3.32	
41	40	2024	4	2	5	1	1	1	2	3	4	3	4	3	1	3	10	1	6	I have had a great experience with the faculty and feel supported.	0	4	1	3	0	0	0	0	0	0	0	1	0	7		3.16
42	41	2024	3	5	4	5	5	3	3	1	3	1	1	2	1	1	8	10	5	I appreciate the effort of staff in making resources available.	1	3	4	1	0	1	0	1	0	0	1	0	8		3.73	
43	42	2024	5	3	3	5	5	1	4	4	4	3	1	4	2	4	2	1	4	I have had a great experience with the faculty and feel supported.	0	3	3	7	0	0	0	0	0	0	1	0	7		2.58	
44	43	2024	4	1	3	1	3	4	3	4	1	3	4	2	1	2	1	1	10	Overall, the student activities have been enjoyable and engaging.	1	4	3	1	0	0	0	0	0	0	1	0	7		2.94	
45	44	2024	3	4	2	3	1	3	4	4	4	1	2	1	1	4	5	10	5	I appreciate the effort of staff in making resources available	0	3	1	3	0	0	0	0	0	0	0	0	9		3.24	

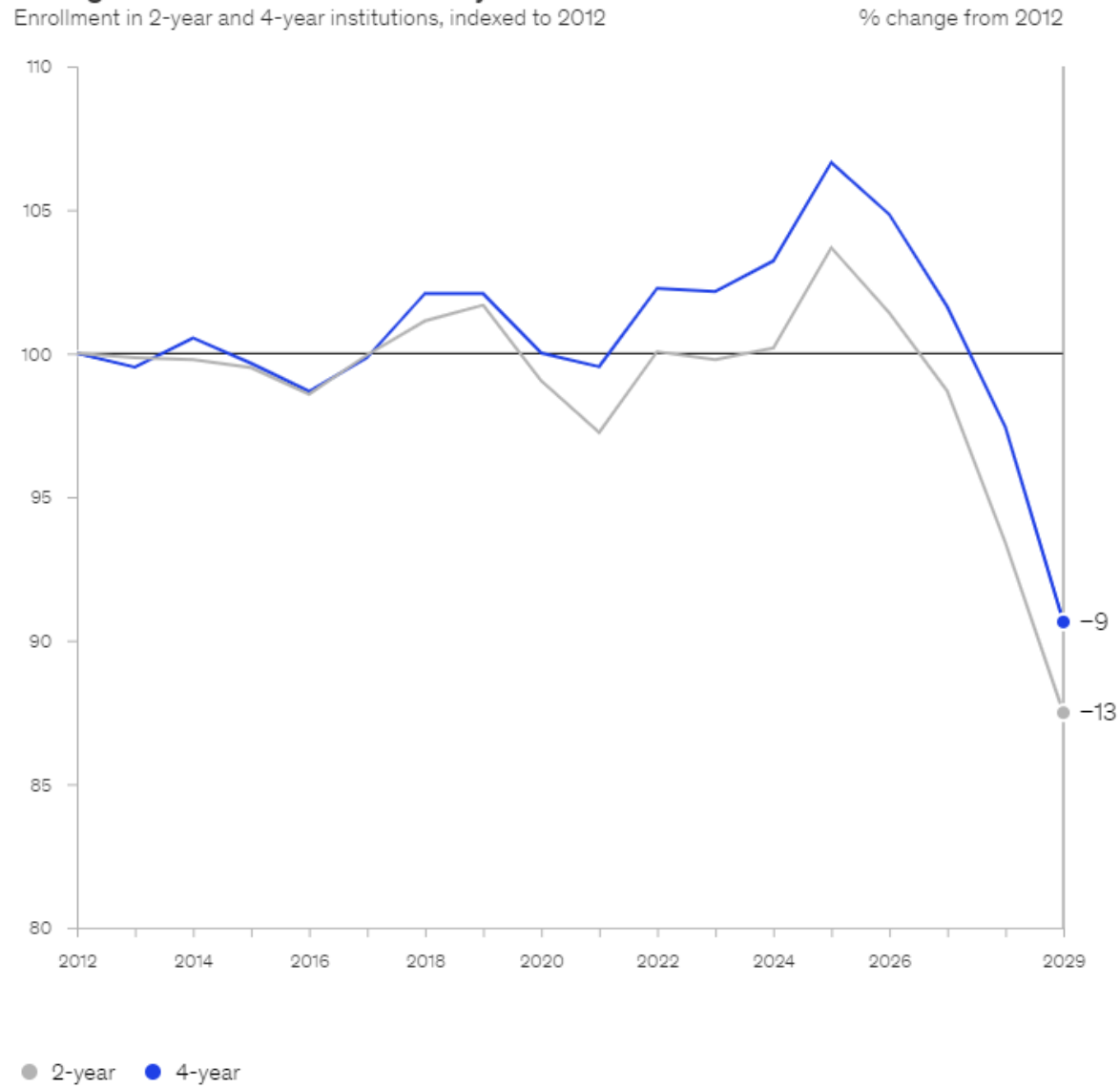
# Visualization

The visual representation of your data for the purposes of facilitating understanding.



## Change in number of enrolled 18-year-olds

Enrollment in 2-year and 4-year institutions, indexed to 2012



Perceiving

What do you see?

Interpreting

What does the visualization mean?

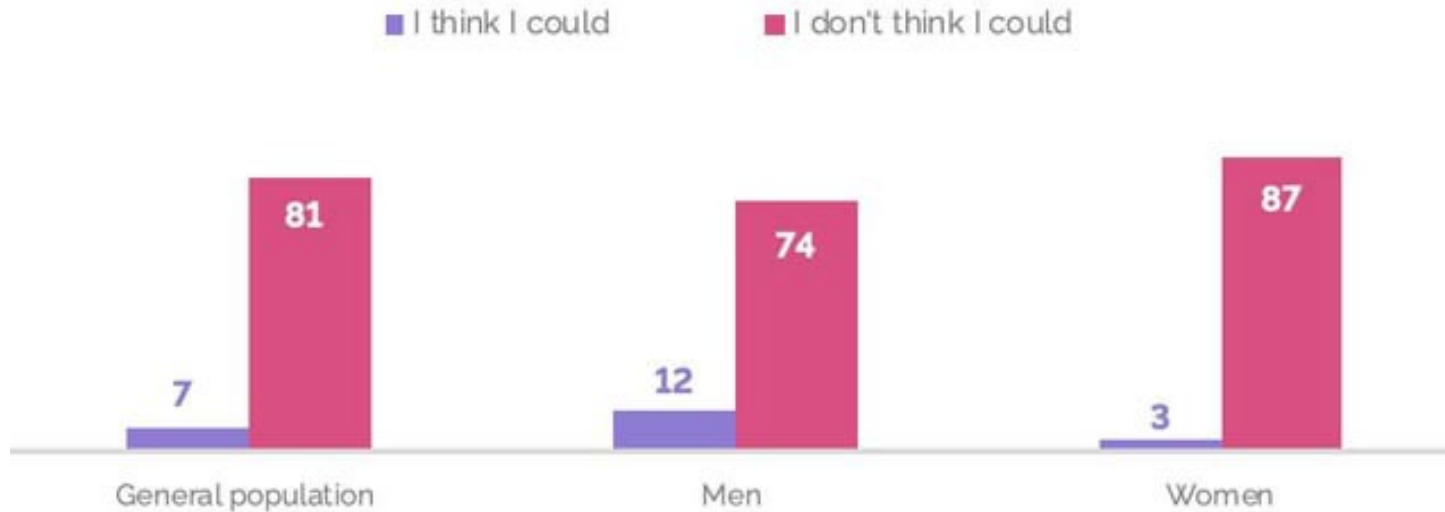
Comprehending

What does the visualization mean *to you*?

Data: Nathan D. Grawe, *Demographics and the Demand for Higher Education*, Baltimore: Johns Hopkins University Press, 2018

## One in eight men think they could take a point off Serena Williams

Do you think if you were playing your very best tennis, you could win a point off Serena Williams? %



YouGov | yougov.com

12 Jul, 2019

Perceiving

What do you see?

Interpreting

What does the visualization mean?

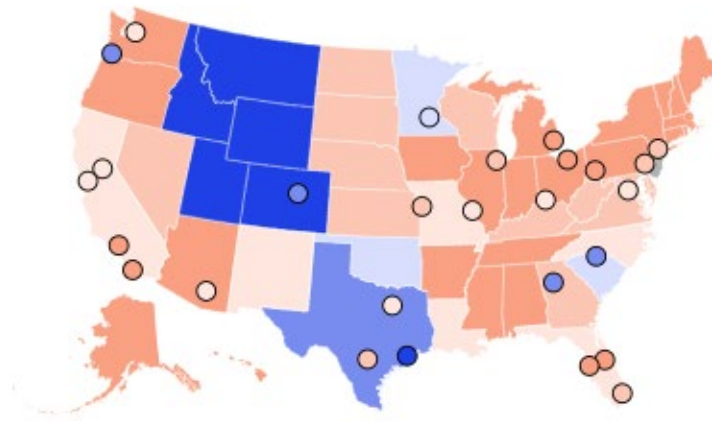
Comprehending

What does the visualization mean *to you*?

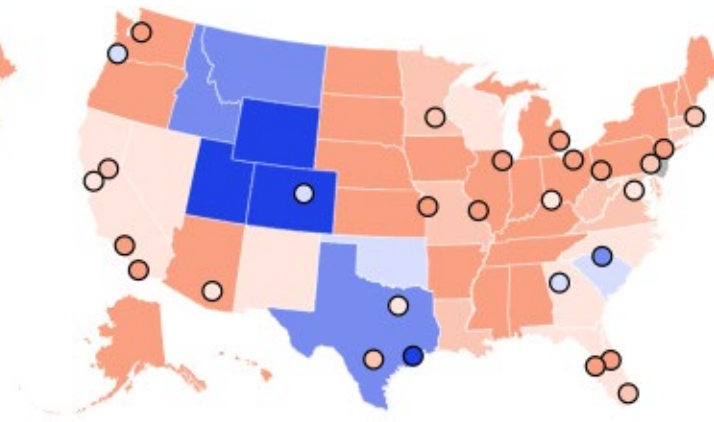
## Population growth

Forecasted % change in number of 18-year-olds, 2012–29

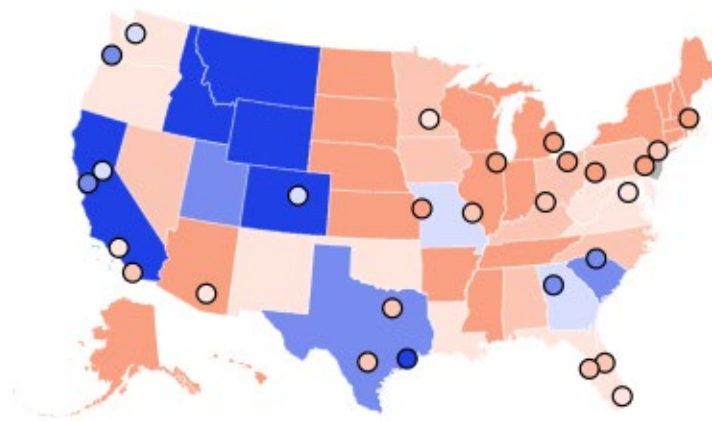
Number of all 18-year-olds



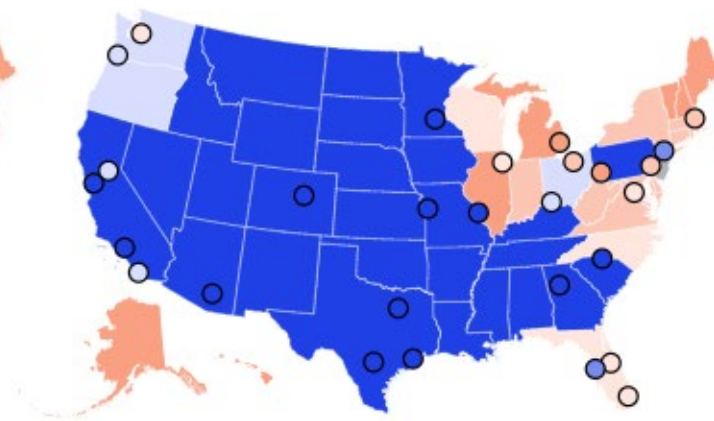
Number who will attend a 2-year school



Number who will attend a 4-year school



Number who will attend a 'top-ranked' school

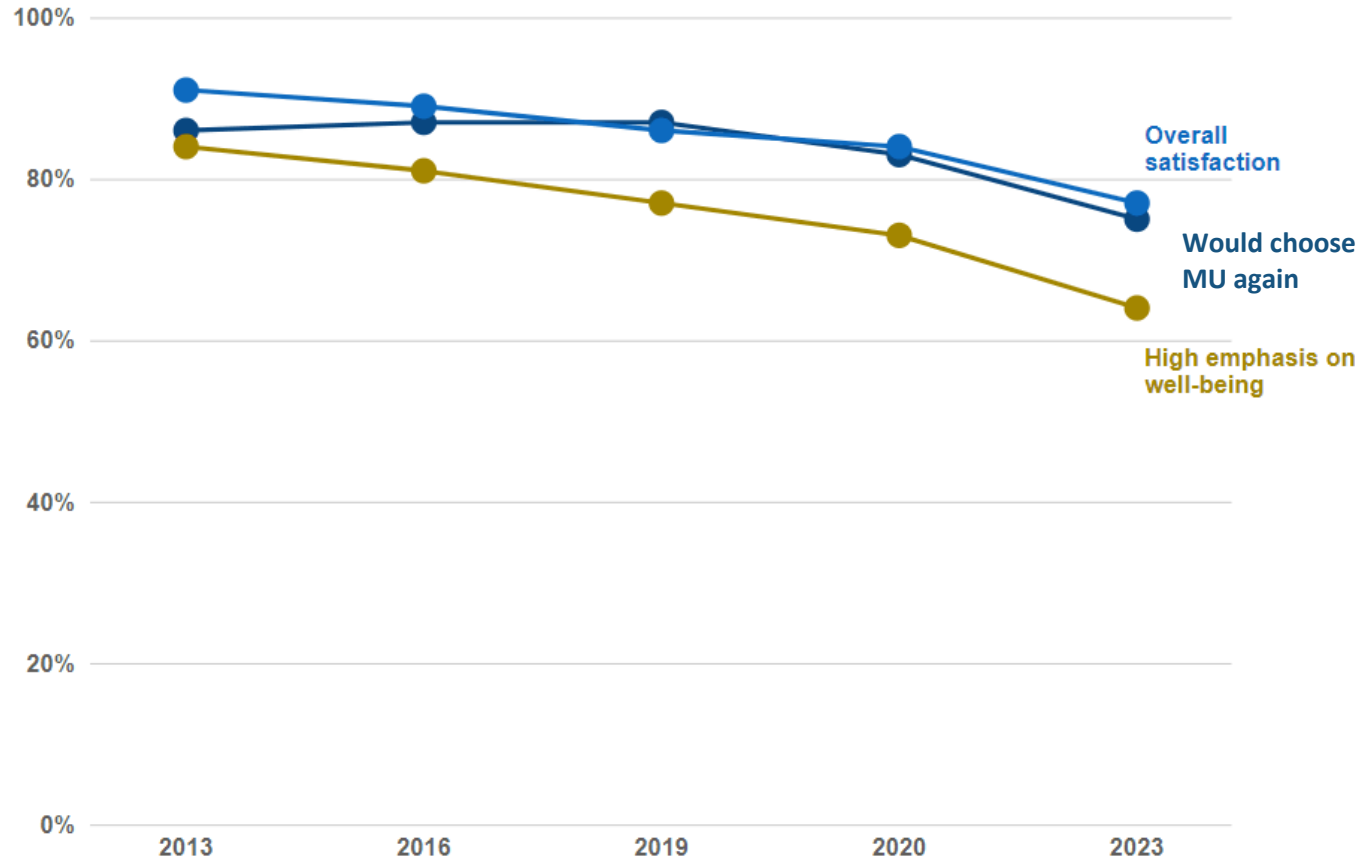


From Emma Don, et al, [Higher education enrollment: Decline or online opportunity?](#), McKinsey & Company

# Narrative

1. Setting / setup
2. Characters
3. Conflict
4. Resolution

## First-year student satisfaction, choice, and college emphasis on well-being at Midwest University



### Setting

What is the setting?

### Characters

Who are the characters?

### Conflict

What is the conflict?

### Resolution

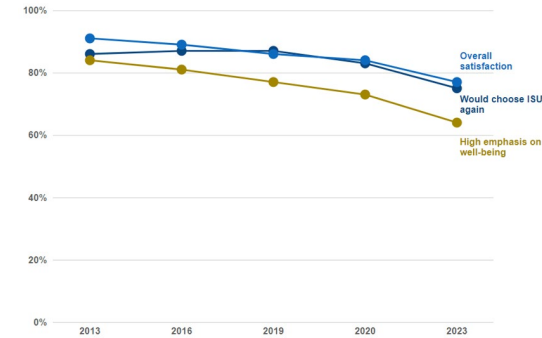
What is the resolution? What is the call to action?

# Data storytelling is taking this...

[illegible]

And turning it into this...

Age Group	Percentage
18-24	~85%
25-34	~88%
35-44	~90%
45-54	~92%
55-64	~94%
65+	~95%



So you can do this...

Based on the 10-year trend, we need to increase the emphasis on interactions and wellness in the classroom, as students cite it as a key factor in their declining satisfaction.

We need to share this data with our student well-being committee and create action steps.

We need to connect this data with data on retention to see if there's a relationship with retention.

“A dashboard is created to inform.

A data story is created to educate.”

Kat Greenbrook, The Data Storyteller's Handbook

# Exploratory

Reader driven. Typically, a giant dashboard.

# Explanatory

Author driven. Typically, a small visualization.

# Exploratory. Reader driven. Typically, a giant dashboard.



## NSSE 2020 Sense of Belonging An Interactive Data Display

For students to have a sense of belonging, they must feel like they can relate to others within the campus community. This is an important concept because sense of belonging affects student persistence. Institutions can develop interventions that improve a student's sense of belonging over time. The Sense of Belonging scale is an overall score of three items (see below) expressed on a 60-point range similar to the NSSE Engagement Indicators.

STEP 1: Set the class level and institutional characteristics for all Sense of Belonging results below, including those in both steps 2 and 3.

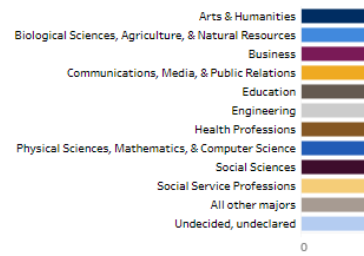
Class level  
☒ First-year  
☐ Senior

U.S. Carnegie Classification: (All)  
U.S. Institutional control: (All)  
U.S. region or Canada: (All)  
U.S. HSI status: (All)  
U.S. HBCU status: (All)

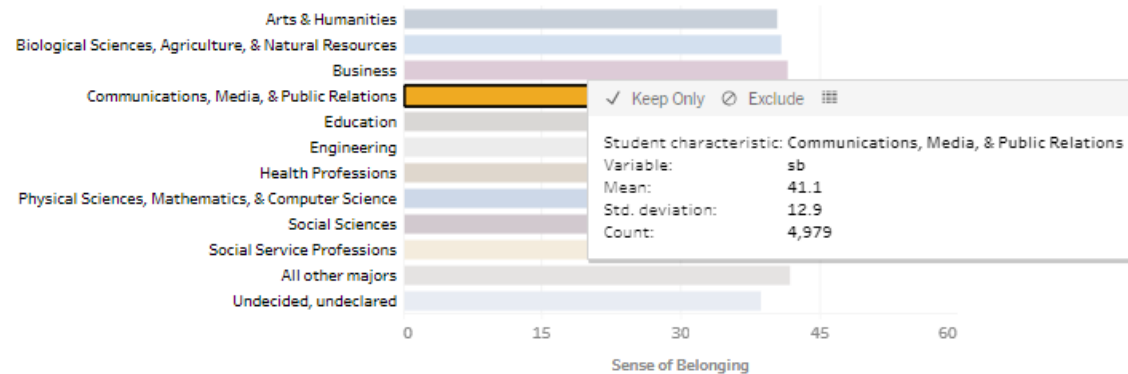
STEP 2: Select a student characteristic for comparisons in the chart to the right (step 1 filters also apply).

- ☒ Major field category
- ☐ Gender identity
- ☐ Racial/ethnic identity (U.S. only)
- ☐ International student (U.S. only)
- ☐ Ability status
- ☐ First-generation status
- ☐ Sexual orientation
- ☐ Enrollment status
- ☐ Transfer status
- ☐ Living situation
- ☐ Course modality (spring)
- ☐ Intent to return (FY only)

### Sense of Belonging by Student Characteristic



### Sense of Belonging by Student Characteristic

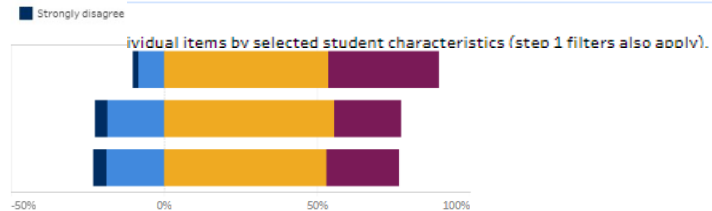


STEP 3: Explore Sense of Belonging individual items by selected student characteristics (step 1 filters also apply).

Major field category: (All)  
Gender identity: (All)  
Racial/ethnic identity (U.S. only): (All)  
International student (U.S. only): (All)  
Sexual orientation: (All)  
Enrollment status: (All)  
Transfer status: (All)  
Living situation: (All)

To what extent do you agree or disagree with the following statement

	Strongly disagree	Disagree	Agree	Strongly agree
I feel comfortable being myself at this institution	2%	8%	54%	36%
	3,736	15,232	99,411	66,895
I feel valued by this institution	4%	19%	56%	22%
	7,391	34,474	102,845	40,340
I feel like part of the community at this institution	4%	19%	53%	24%
	7,738	34,862	98,603	44,054



### Sense of Belonging and Engagement

Sense of Belonging is related to other dimensions of engagement. The relationship of the three individual items with two NSSE Engagement Indicators (EIs) is shown below. For information about all EIs, visit <https://nsse.indiana.edu/nsse/survey-instruments/engagement-indicators.html>



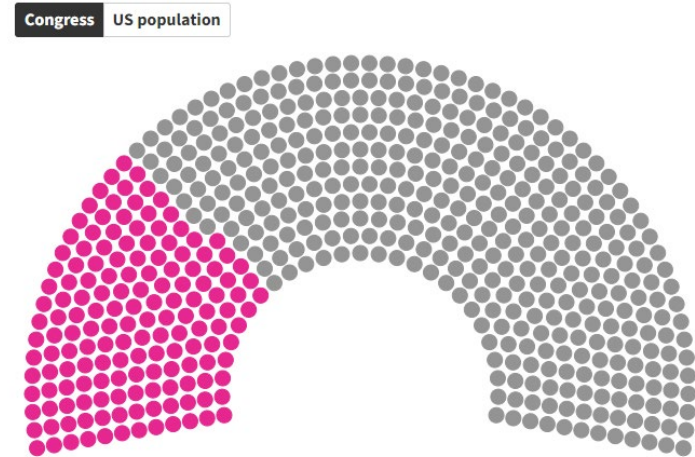
Title describes the data, not the story.

Story is dependent on the user. Users can gain multiple perspectives on the data through filters.

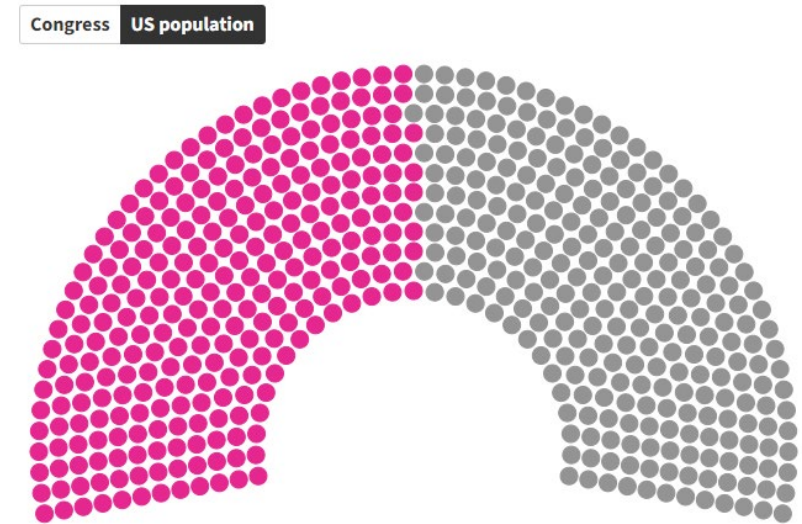
Explanatory. Author driven. Typically, a small visualization.

**Women comprise 28.7% of Congress and 50.4% of the US population.**

Women's share of Congress and of the US population adjusted to the size of Congress.



Sources: [Congressional Research Service](#) • As of April 2024.



Title describes the **story**, not the data.

Low level of interactivity  
(one filter).

Visualization is intuitive and based on the story,  
not the data (shape of congress).

Visualization uses colors to reinforce the story.

[UAS Facts, Representation  
of Women in Congress](#)

If you want to communicate a specific influential narrative and know your audience, go with **explanatory**.

If you want your audience to discover the story and have a repository of information that can be referenced over time, go with **exploratory**.

# 1. Articulate the problem

Student retention rates have been declining over the past five years. We need to understand the factors contributing to this trend.

Low levels of belonging among college students are contributing to decreased engagement, retention, and overall well-being. We need to understand why and address the problem.

# “What’s the point”

Stephanie Evergreen, [The Most Important Question](#)

## 2. Know your audience & their needs

“List all the audiences for your project and **prioritize the top three**.

Determine whether each audience is **internal or external** to your organization (or problem area), as this affects how you present data.

Recognize whether your audience is **technical or non-technical** and adjust your data presentation accordingly.”

# 3. Define the purpose of the viz

1. To **discover** insights in the data – maybe a exploratory dashboard?
2. To **inform** others about the data – maybe an explanatory viz.
3. To **educate** others about the data – a mix of both.

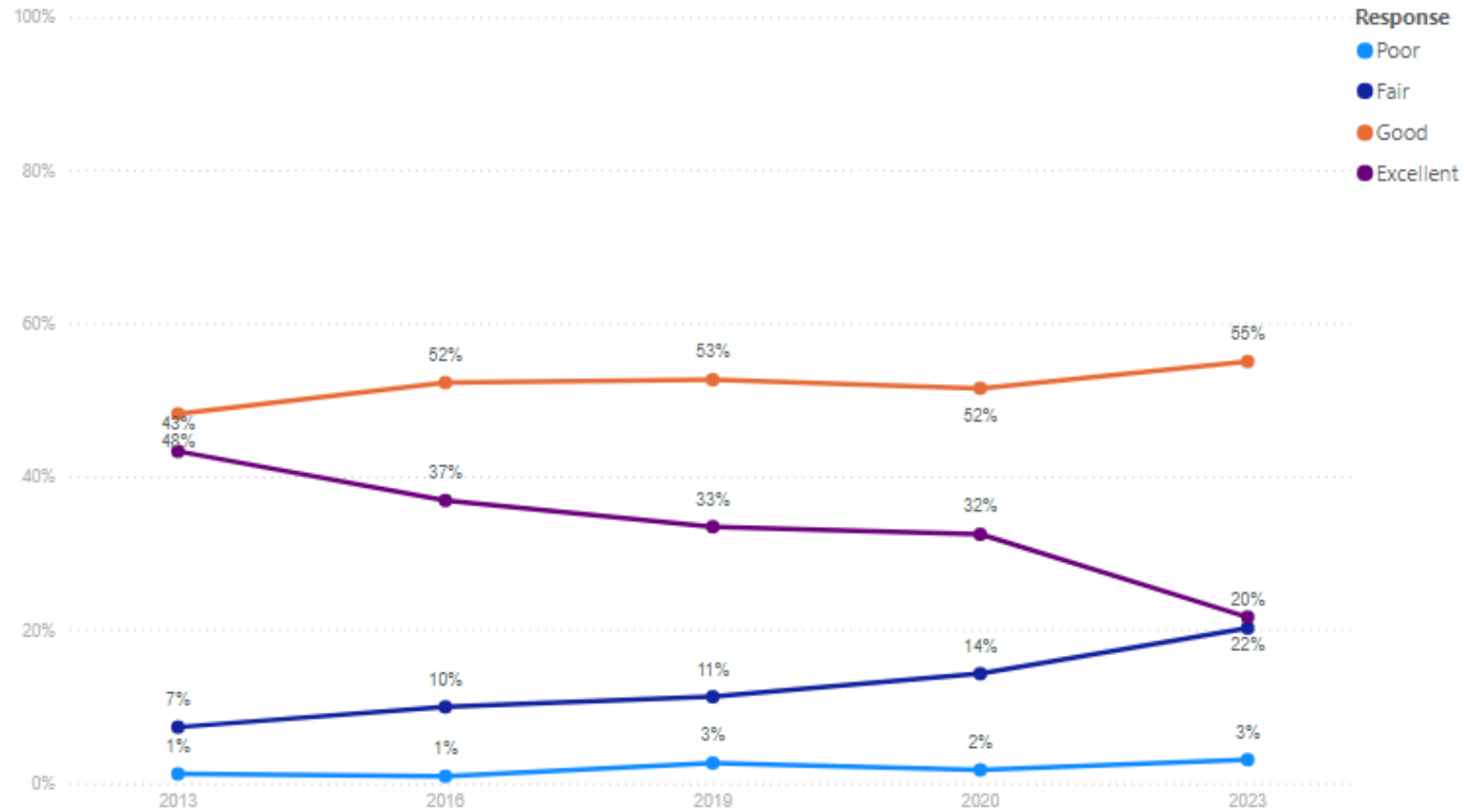
## 4. Call to Action – Mad Libs

The purpose of this visualization is to [discover an insight, inform, educate] in order to [explain why it is important]. This visualization helps [identify key insights] and supports [decision-making process or action], ultimately benefiting [specific audience] by [outlining value or impact].

Source might be non-credited

# Avoid legends if you can

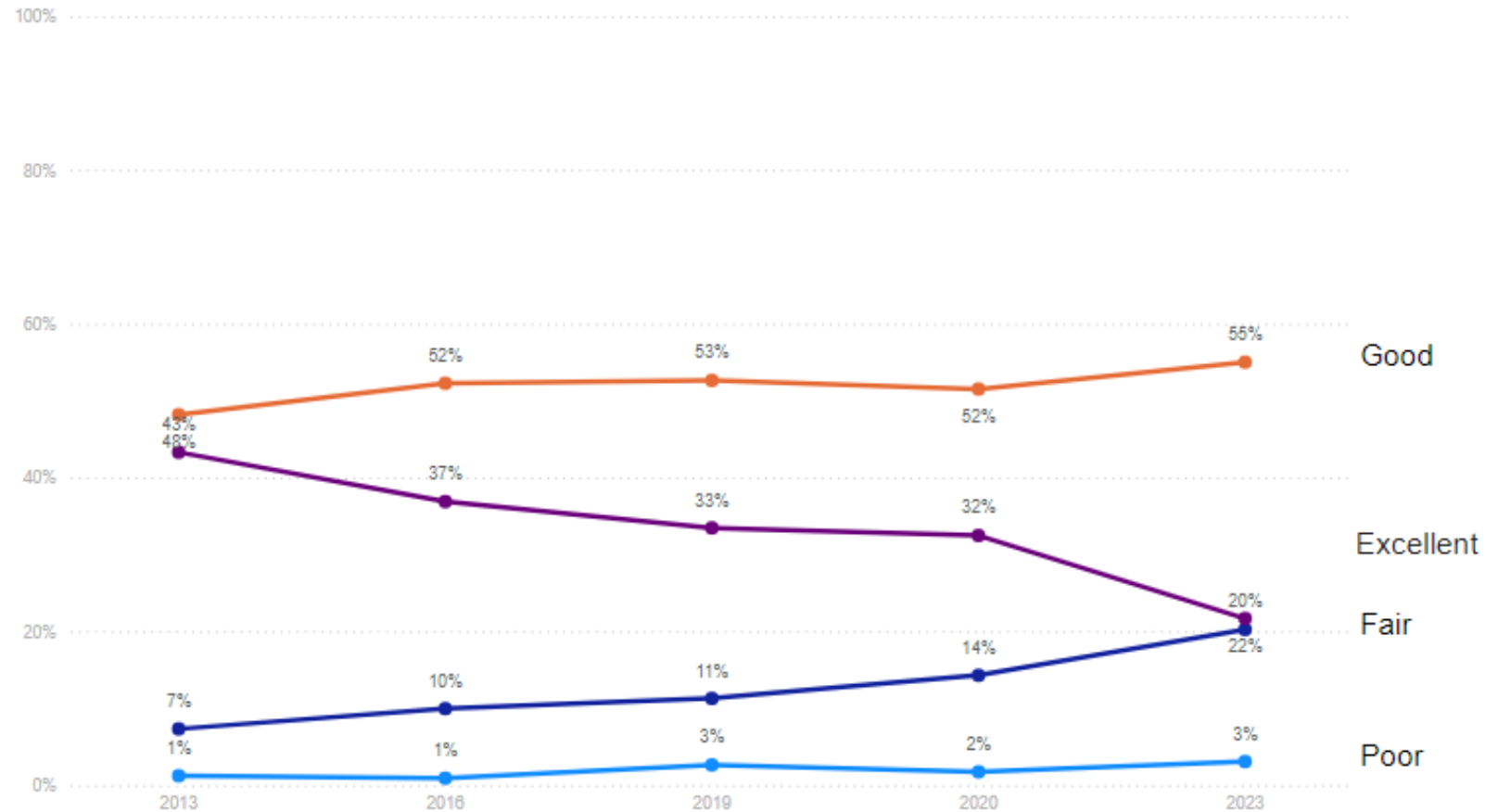
First-year satisfaction rates: 2013-2023



See [Ditch Your Chart Legend](#), Stephanie Evergreen

# Avoid legends if you can

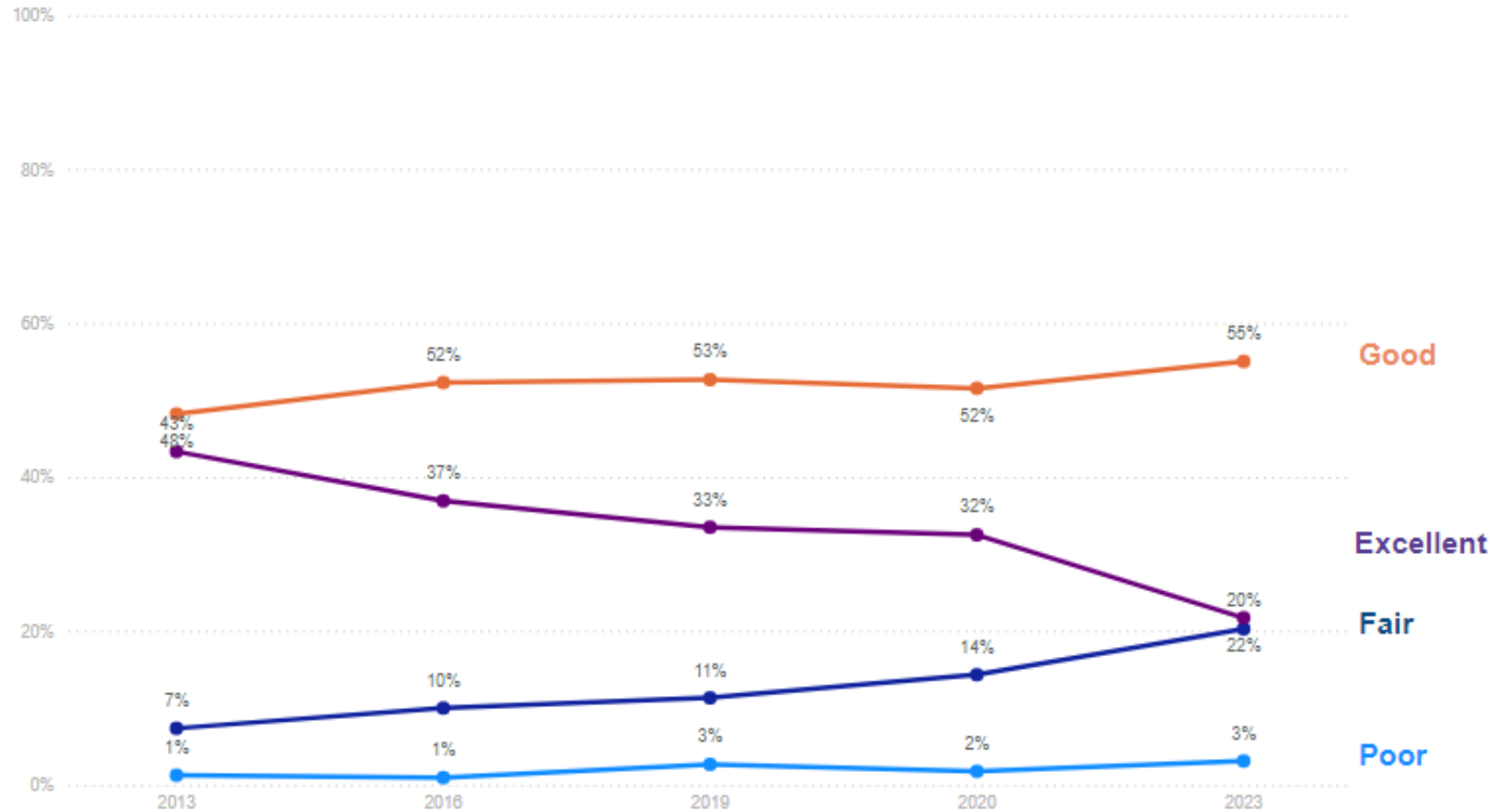
First-year satisfaction rates: 2013-2023



See [Ditch Your Chart Legend](#), Stephanie Evergreen

# Avoid legends if you can

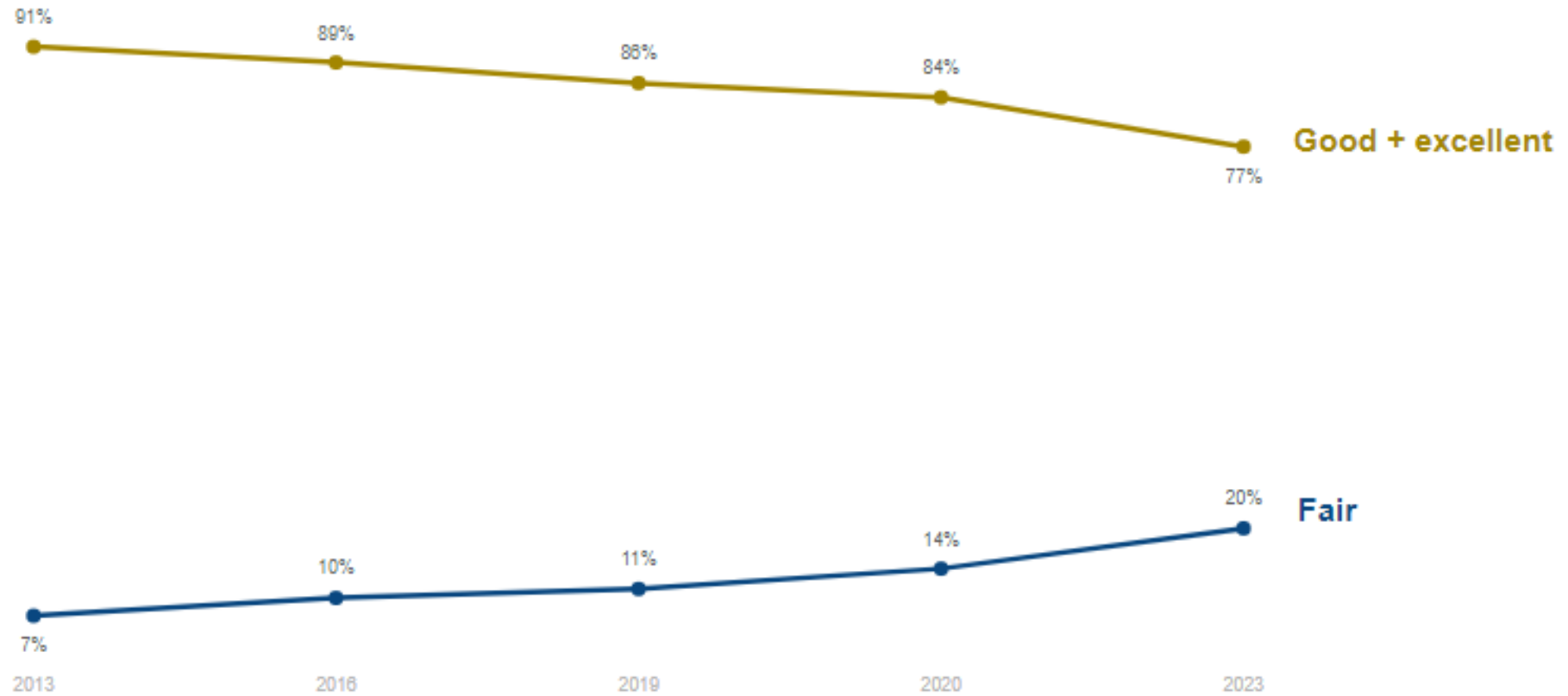
First-year satisfaction rates: 2013-2023



See [Ditch Your Chart Legend](#), Stephanie Evergreen

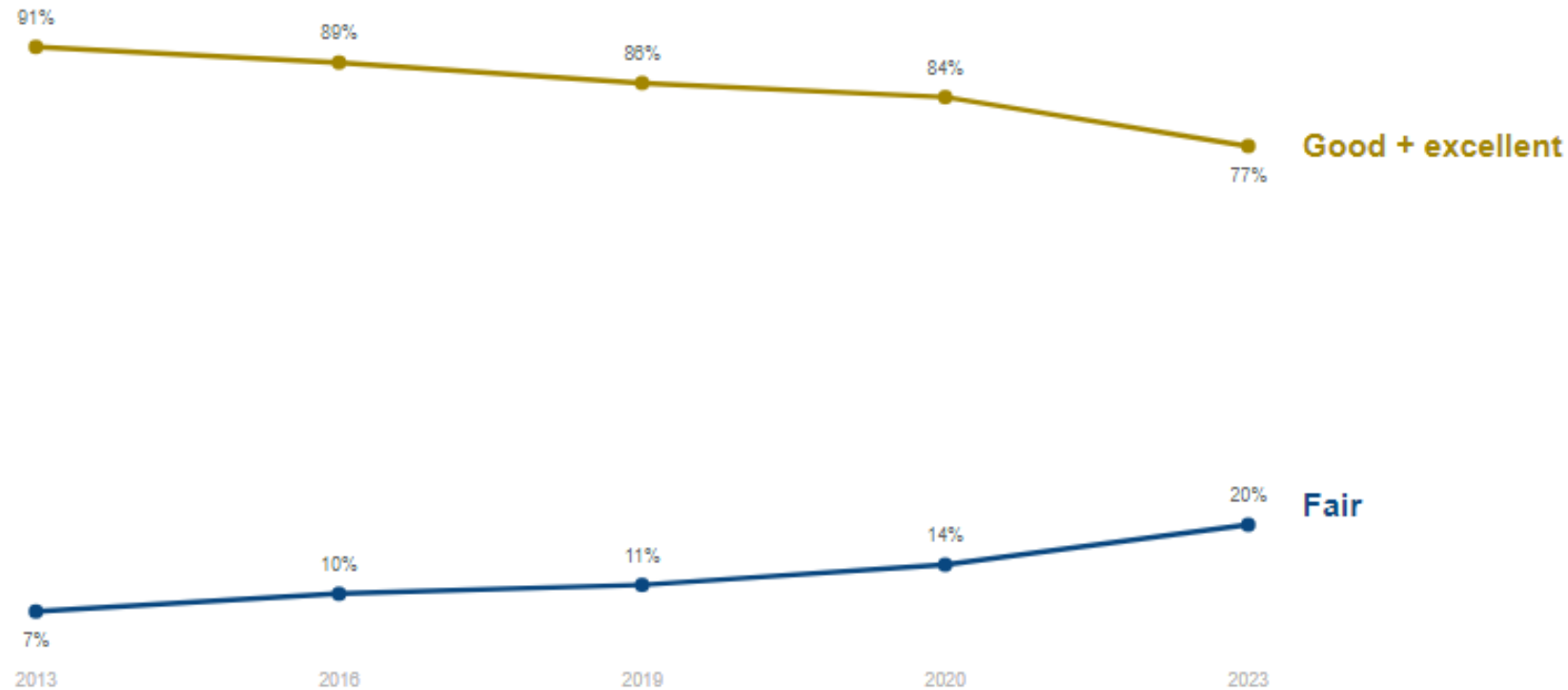
# Pay attention to colors

First-year satisfaction rates: 2013-2023



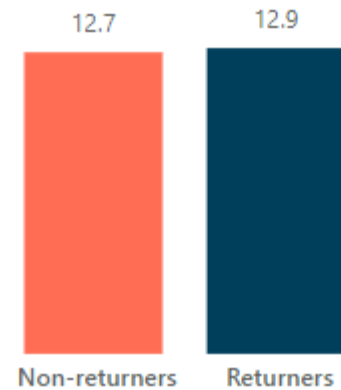
# Make the title descriptive

The percent of first-year students who have a **fair** college experience at Midwest College has more than doubled over the last 10 years. Students reporting an **positive** experience has decreased.



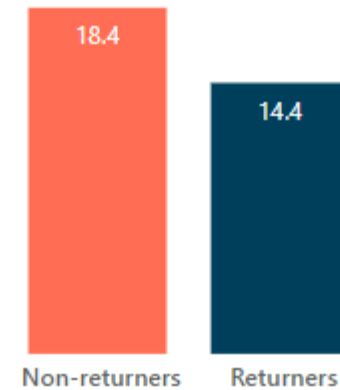
Non-returners spend just as much time on academic work as returners...

**Average hours per week on academic work and studying**

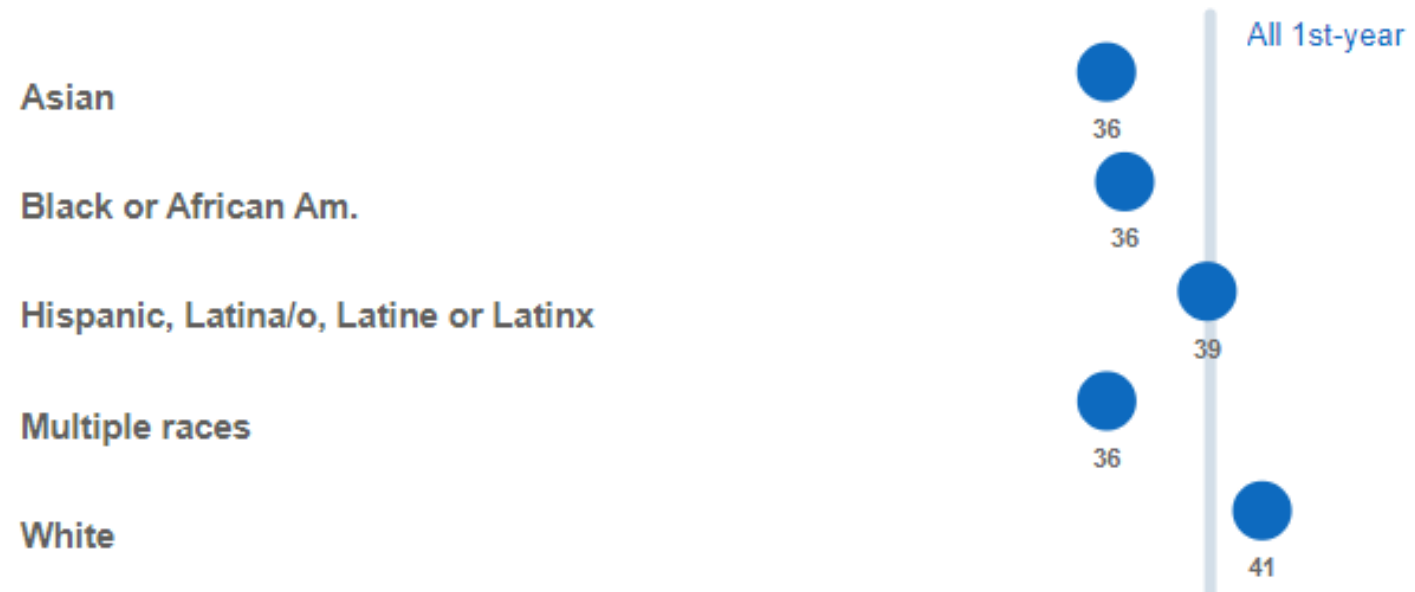


...and have **a lot more** non-college family, work, and other demands for their time.

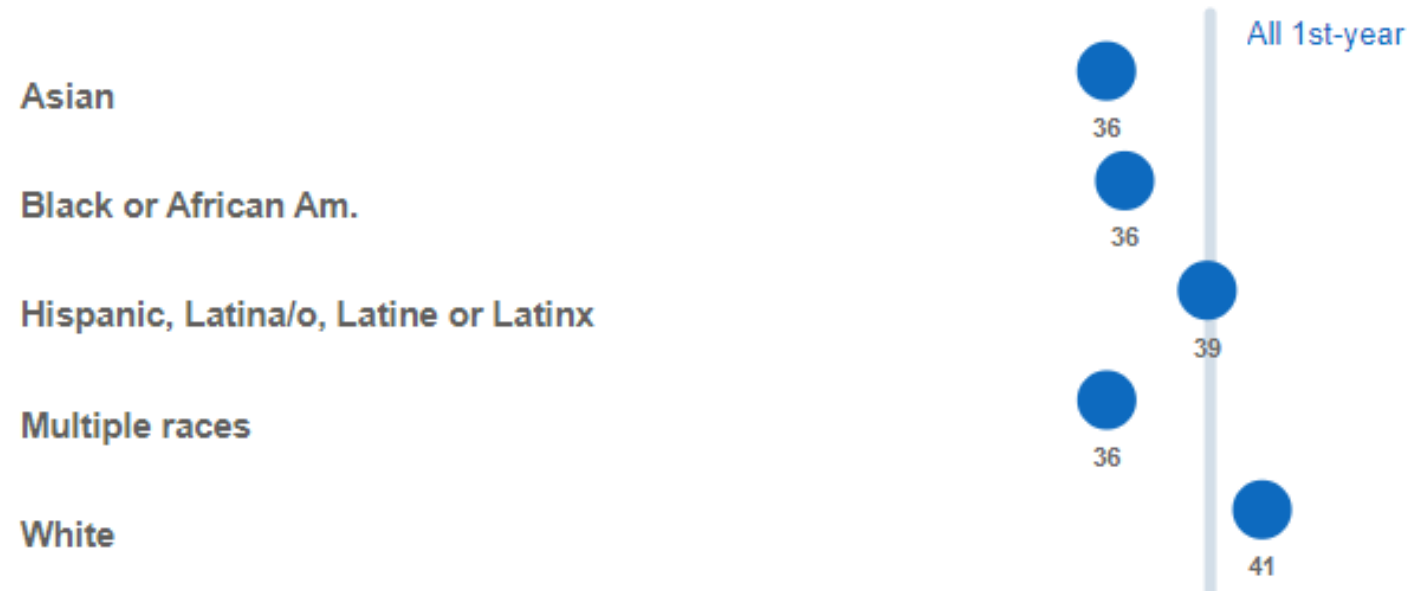
**Average hours per week working off campus**



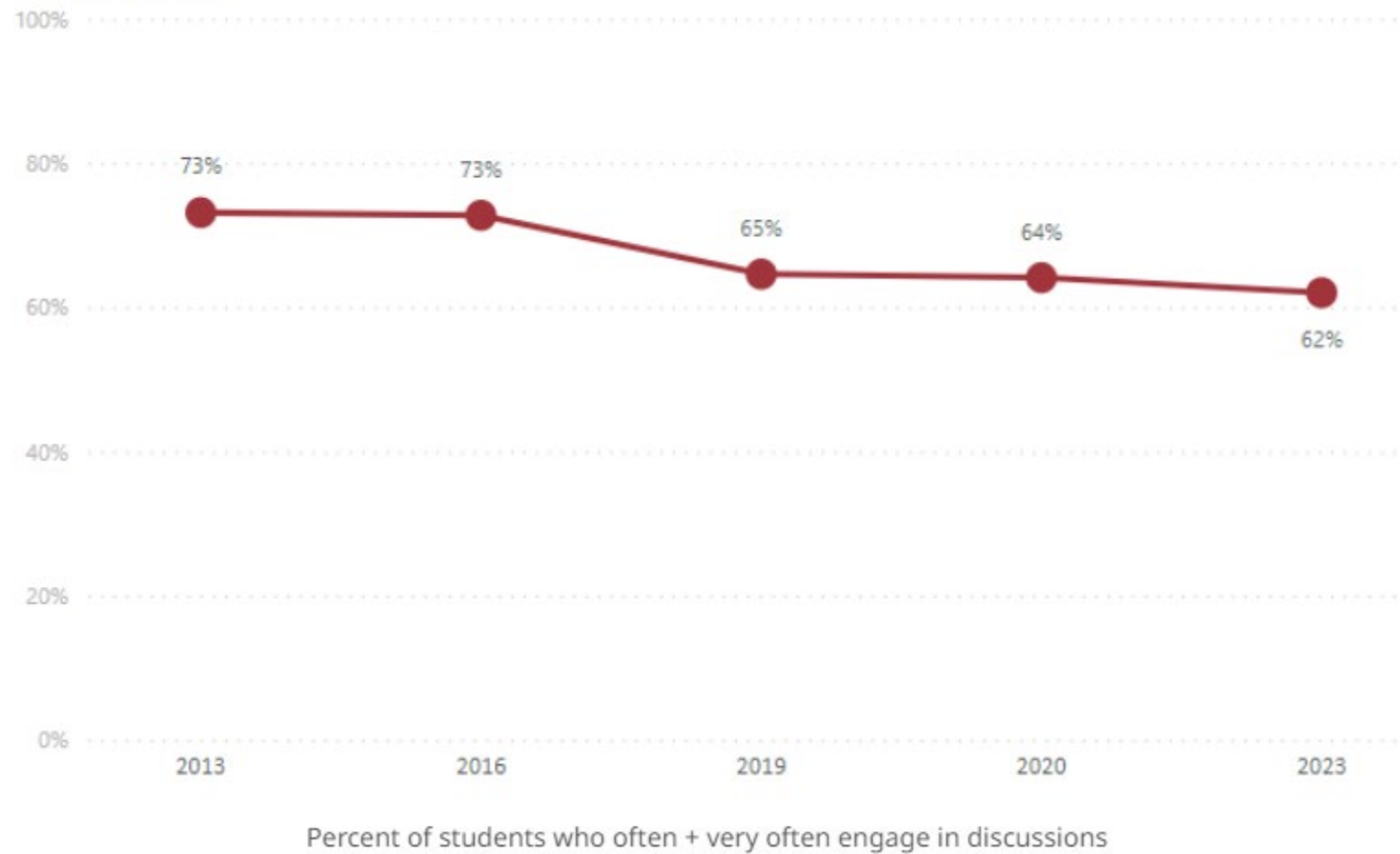
White students express the highest levels of belonging, with Asian, Black and Multiracial students reporting lower levels of belonging.



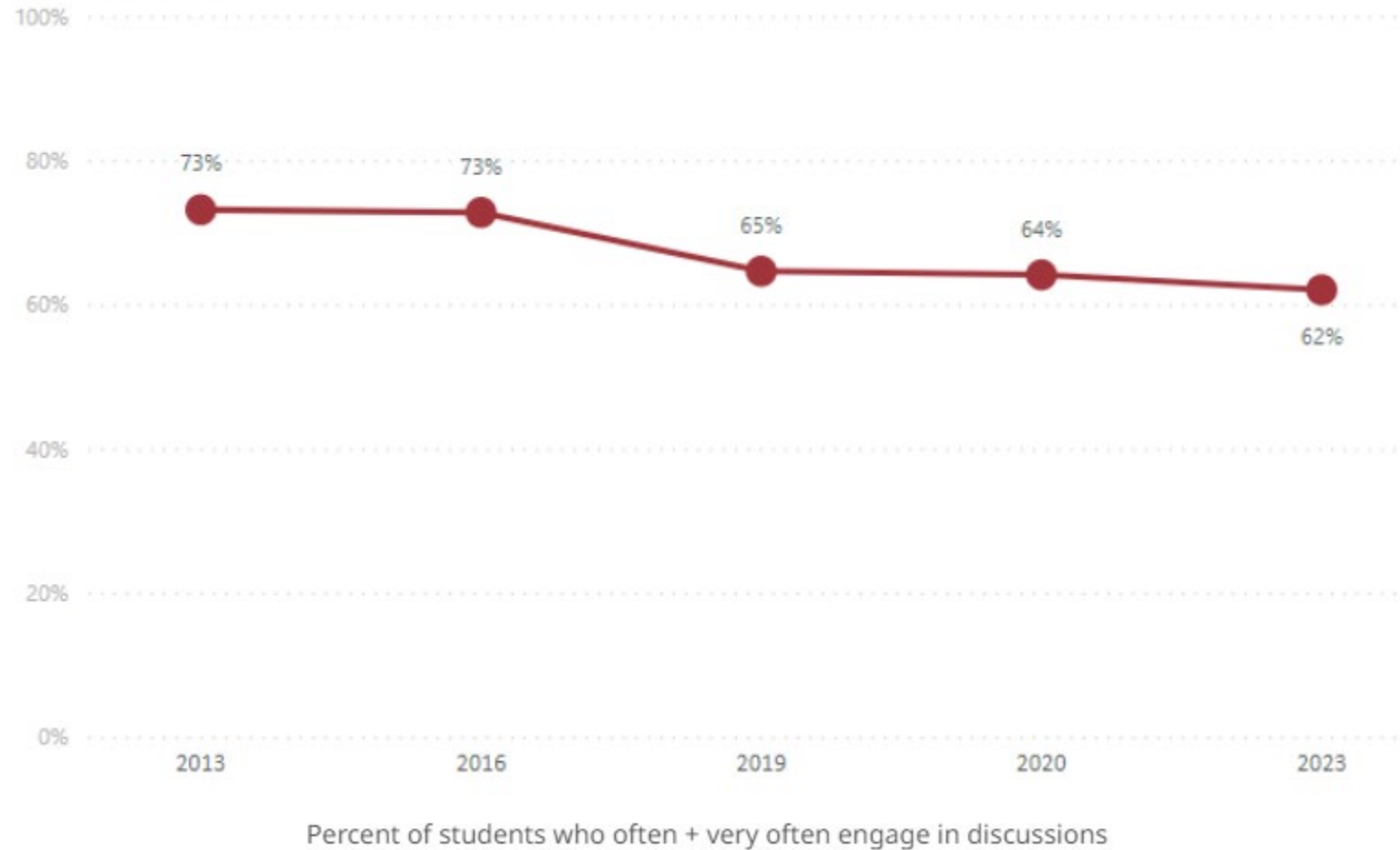
Disparities in belonging by race / ethnicity point to needed transformations in how we approach well-being, classroom culture, and representation.



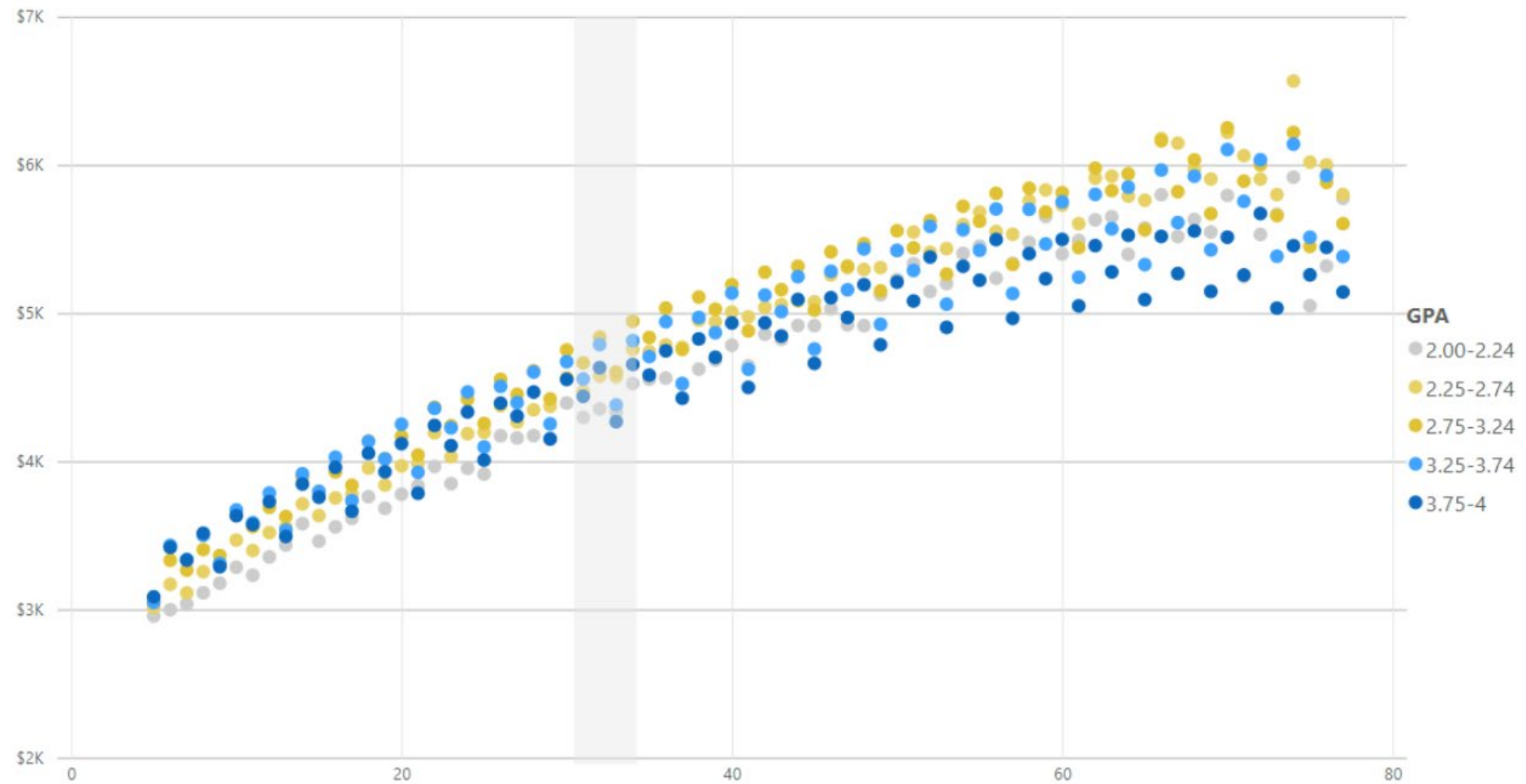
ISU seniors are engaging in less discussions with people from different political backgrounds.



ISU seniors are engaging in less discussions with people from different political backgrounds. This points to the need for our **deliberative dialog program** and **teaching students how to engage in constructive dialog**.



C's do get degrees. **Middle GPA** students earn higher monthly incomes than students with **higher GPAs**. The middle GPA students take over around year seven (the grey bar).



Students enrolled in **hybrid/blended** learning environments report the same learning gains, belonging, and frequency of student-faculty interaction as students enrolled in **in-person** courses.



