Welcome, Core Faculty, Head TAs, and Freshman Advisers!

Caltech

September 13, 2017

10:00 Opening discussion
Who are Caltech students and how do they learn?

11:00 Prof. Noah Finkelstein, Univ. of Colorado, Boulder
Practices, Tools, and Evidence for Improving Large Introductory Science and Math Courses (part 1)

12:00 Lunch Buffet (Annenberg 106)

12:15 Breakouts: *Please take lunch to one of the following*
- Annenberg 105: Core/Pseudo-core Faculty and TAs
- Annenberg 213: Freshman Advisors

Welcome!

Leadership and Implementation Team:

Cindy Weinstein, Vice Provost
Kevin Gilmartin, Undergraduate Dean
John Hall, Core Steering Committee Chair
Sarah Reisman, Chemistry EO
Cassandra Horii and Jenn Weaver, CTLO
Hanna Song, CCD
Lesley Nye and Barbara Green, Dean's Office

Goals for today:

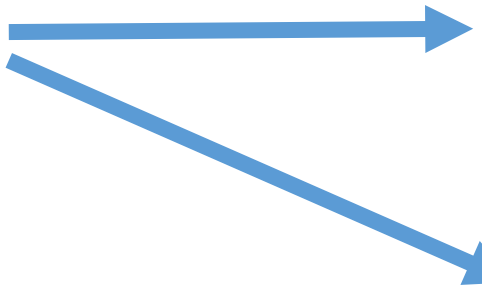
Dr. Cassandra Horii, Director, CTLO

- Explore student data to better understand Caltech students' experiences, ways of thinking, and goals.
- Apply relevant, recent research on university STEM education to teaching in the Core and advising freshmen.
- Generate ideas for follow-up with Core faculty, head TAs, and freshman advisers in the coming year.

Updates and materials

https://teachlearn.caltech.edu/Core/2017_18

- Information



- Mid-quarter feedback: shared survey in week 4: Ma 1a, Ph 1a, Ch 1a, CS 1

Science/Math Core Days and Times

Course + Website	Lectures	Recitations	Millikan 9th Floor Study	Problem Sets Due
Ma 1a	MWF	R (Thurs)	F 8-11 pm	M 4 pm
Ph 1a	WF	MR	M 8-11 pm	W 4 pm
Ch 1a	MT	R	T 8-11 pm	F 4 pm

Approximate weekly topics

Fall 2017	Ma 1a	Ph 1a	Ch 1a
Wk 1 9/25-29	Mathematical induction and the real number system	Freefall & Reference Frames	Bohr Model of Atom
Wk 2 10/2-5	Sequences and Series	Newton's Laws Forces of Nature	Bohr Model of Atom Quantum Mechanics
Wk 3 10/9-13	Continuous Functions	Circular Motion Non-Inertial Frames	Quantum Mech. & Schrodinger Eq. Multi-Electron Atoms & Periodic Trends

Who are Caltech students and how do they learn?

Dr. Hanna Song, Senior Director for Diversity, CCD

Dr. Jenn Weaver, Assistant Director, CTLO

1. Meet Generation Z
2. Caltech admissions & demographics
3. Caltech students' thinking, well-being, and expectations


Who are our Freshmen?
Caltech

Meet “Generation Z”, Americans born after Gen Y (from 1995 to present)

Since they arrived on this planet…

They have never had to watch or listen to programs at a scheduled time

Since they arrived on this planet…

The US has always been at war

Since they arrived on this planet…

Texting has been the preferred mode of digital communication; emails are often ignored

Since they arrived on this planet…

Each year they've been alive the U.S. population has grown by more than one million Latinos

“Multiracial” is the fastest growing youth group in the US

+50%

increase in the multiracial youth population since 2000 (to 4.2 million)

Modern families come in all colors and sizes. Long-standing views of race have been challenged by culture: celebrities, artists, politicians, and athletes of mixed heritage have changed discourse, along with trans-racial and international adoptions

They were raised in an American education system that focused on mainstreaming and classroom diversity

Their education system focused on inclusive classrooms and differentiated instruction

As a result they are collaborative team players where everyone is equal at winning and losing

Parenting styles have shifted

With studies showing the adverse effects of helicopter parenting, parents of Gen Z have been discouraged from mollycoddling. As a result, Gen Z have been given more space than Millennials, accessing answers and inspiration on the Internet, and are more self-directed.

They live in multi-generational households

Gen Z have been raised in larger, extended households as retired grandparents have moved in and Millennial siblings (Boomerang Kids) have moved back home. As a result, they are sharers and have greater affinity and respect for the elderly. Gen Z share many of the same values as the Great Generation.

Traditional gender roles have been challenged

Gender roles and norms are blurring, which may make it harder for Gen Z to find mates and maintain households when they become adults. Self-identity is less constructed by gender than for past generations

They intend to change the world

26%

of 16-to-19 year olds are currently volunteering

They are eager to start working

Parents of Gen Z encourage their children to find jobs early and independently without their help

55%

of high school students feel pressured by their parents to gain early professional experience

They learned that traditional choices don’t guarantee success

They witnessed the struggles of Millennials (such as older siblings, many still living at home), and have resolved to do things differently

30%
of high school students today are pushing out their graduation date

“

“There’s a lot of stress about finding a job after college and being able to support yourself. My friends and I are really focused on finishing up in four years and having a good career path. There’s less time for reflection because there’s that worry about whether you’re going to be able to survive in the economy if you’re not really directed.”

They think and act like entrepreneurs

Surrounded by DIY education and crowdsourcing, these teens dream of self employment. They feel pressured to gain professional experience at a very early age. Low wage entry level Gen Z jobs lead to competition with struggling Millennials, fueling competitiveness

61%

or high school students want to be an entrepreneur rather than an employee (compared to 43% of college students)

They think spatially and in 4D

Gen Z have always known how to zoom, pinch, and swipe. They have grown up with hi-def, surround-sound, 3D and now 4D—360 degree photography and film is their normal. Ultra slow motion and hi-speed video is their standard

2005

is the year that Google Maps launched with its satellite and zooming functions

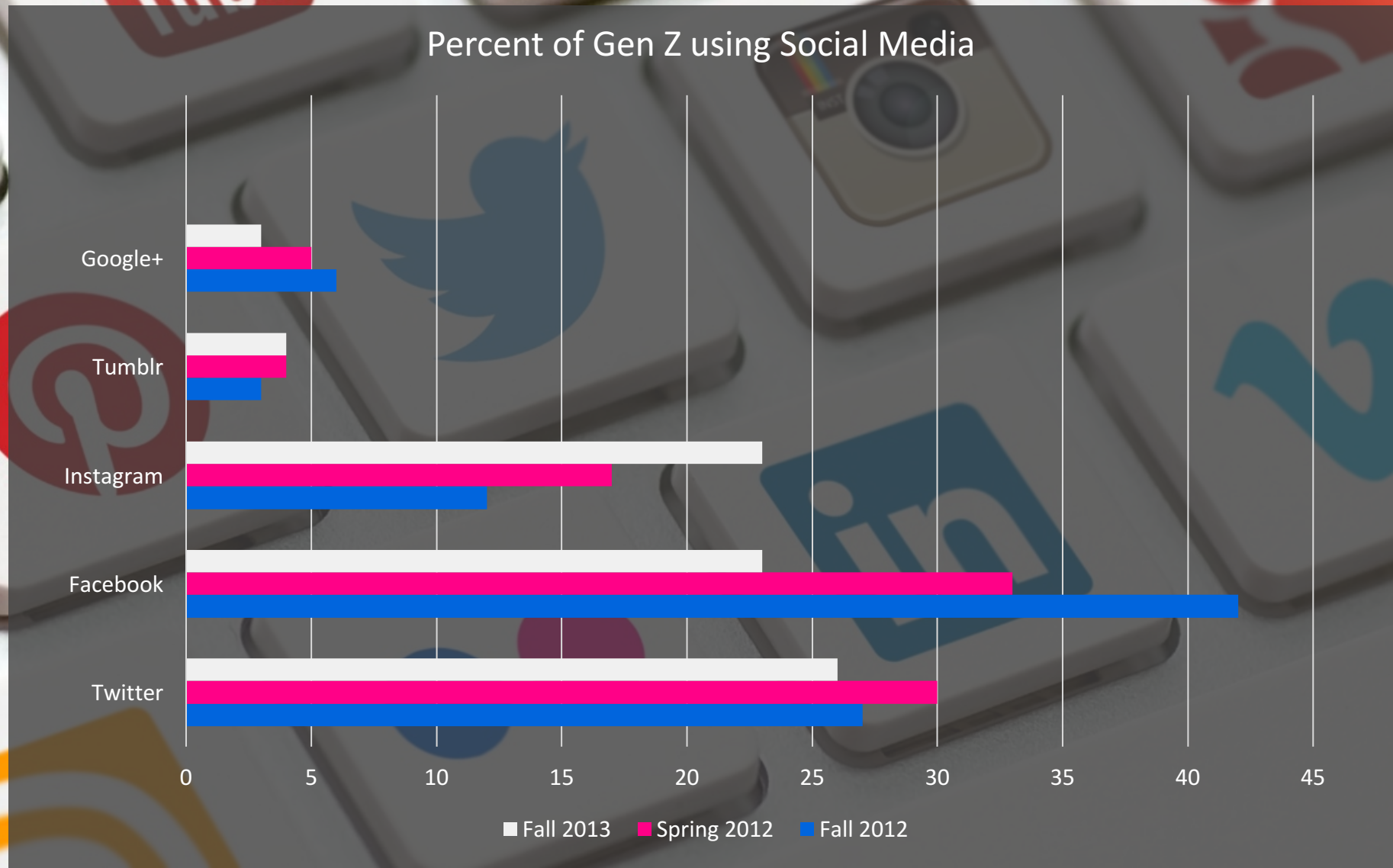
They communicate with speed

46%

of teachers say digital tools make students more likely to “write too fast and be careless”

Gen Z are agile communicators: speed of communication and repartee garners cultural currency. They’re accustomed to rapid-fire banter and commentary. As a result, Gen Z are not precise communicators and leave a lot of room for interpretation.

They communicate with images



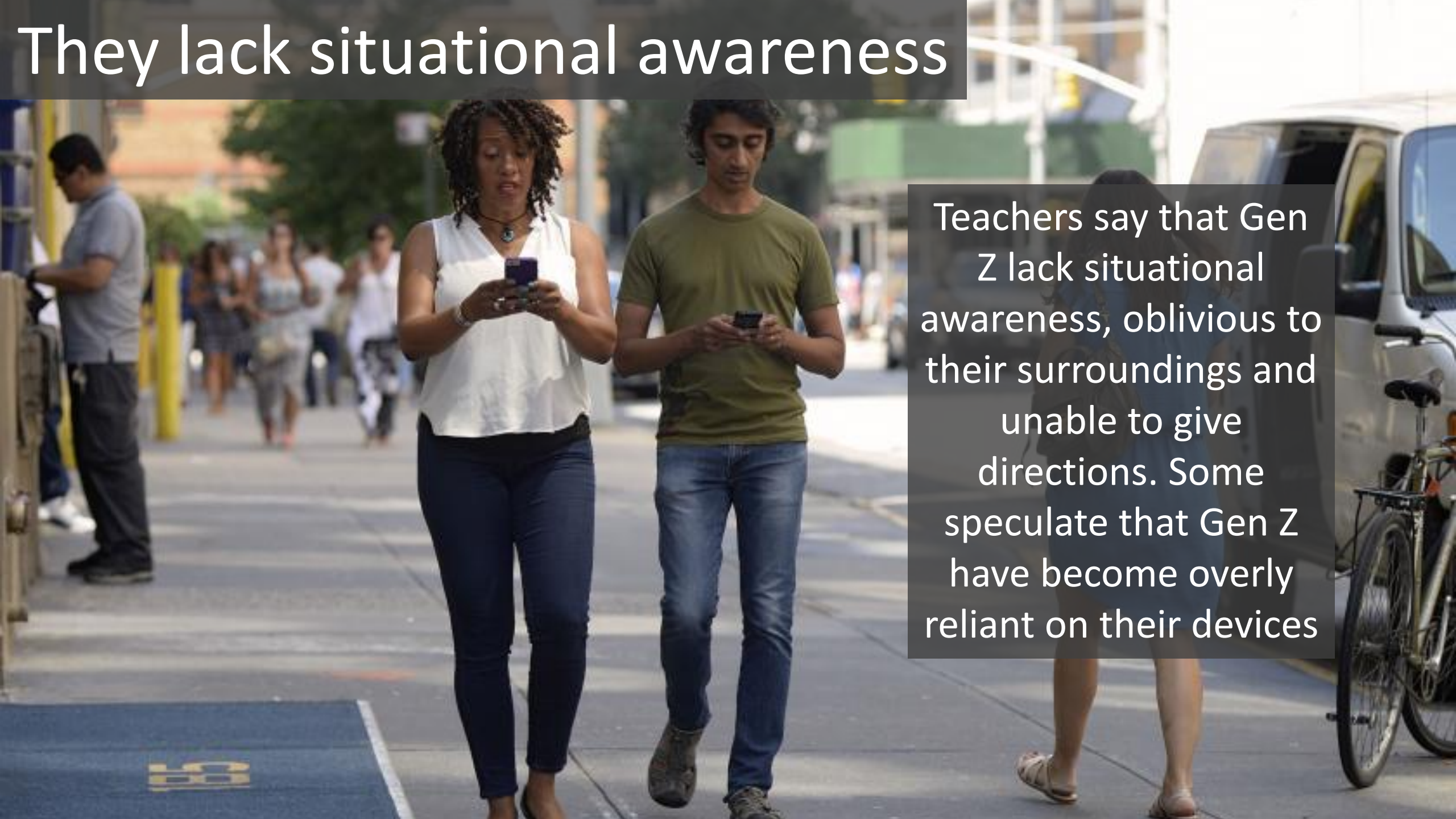
Their attention spans are getting shorter

11%
of children 4-17 years old have been diagnosed with ADHD (up from 7.8% in 2003)

8 sec
is the average American attention span (down from 12 sec in 2000)

Gen Z are the ultimate consumers of snack media. They communicate in bite sizes. Research studies suggest that their brains have evolved to process more information at faster speeds, and are cognitively more nimble to handle bigger mental challenges. But, getting and keeping their attention is challenging

They lack situational awareness

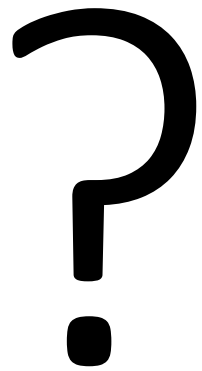


Teachers say that Gen Z lack situational awareness, oblivious to their surroundings and unable to give directions. Some speculate that Gen Z have become overly reliant on their devices

How to connect with Gen Z?

They are different from millennials

Gen Z	Millennials
Tech Innate: 5 Screens	Tech Savvy: 2 Screens
Think in 4D	Think in 3D
Judiciously Share (GeoLoco Off)	Radical Transparency: Share All
Active Volunteers	Slacktivists
Blended (race & gender)	Multi-cultural
Togetherness	Tolerance
Mature	Immature
Communicate with Images	Communicate with Text
Make Stuff	Share Stuff
Have Humility	Have Low Confidence
Future Focused	Now Focused
Realists	Optimists
Want to Work for Success	Want to be Discovered
Collective Conscious	Team Orientation



What differences stand out to you between our incoming students' generation & yours?

Welcome Class of 2021!

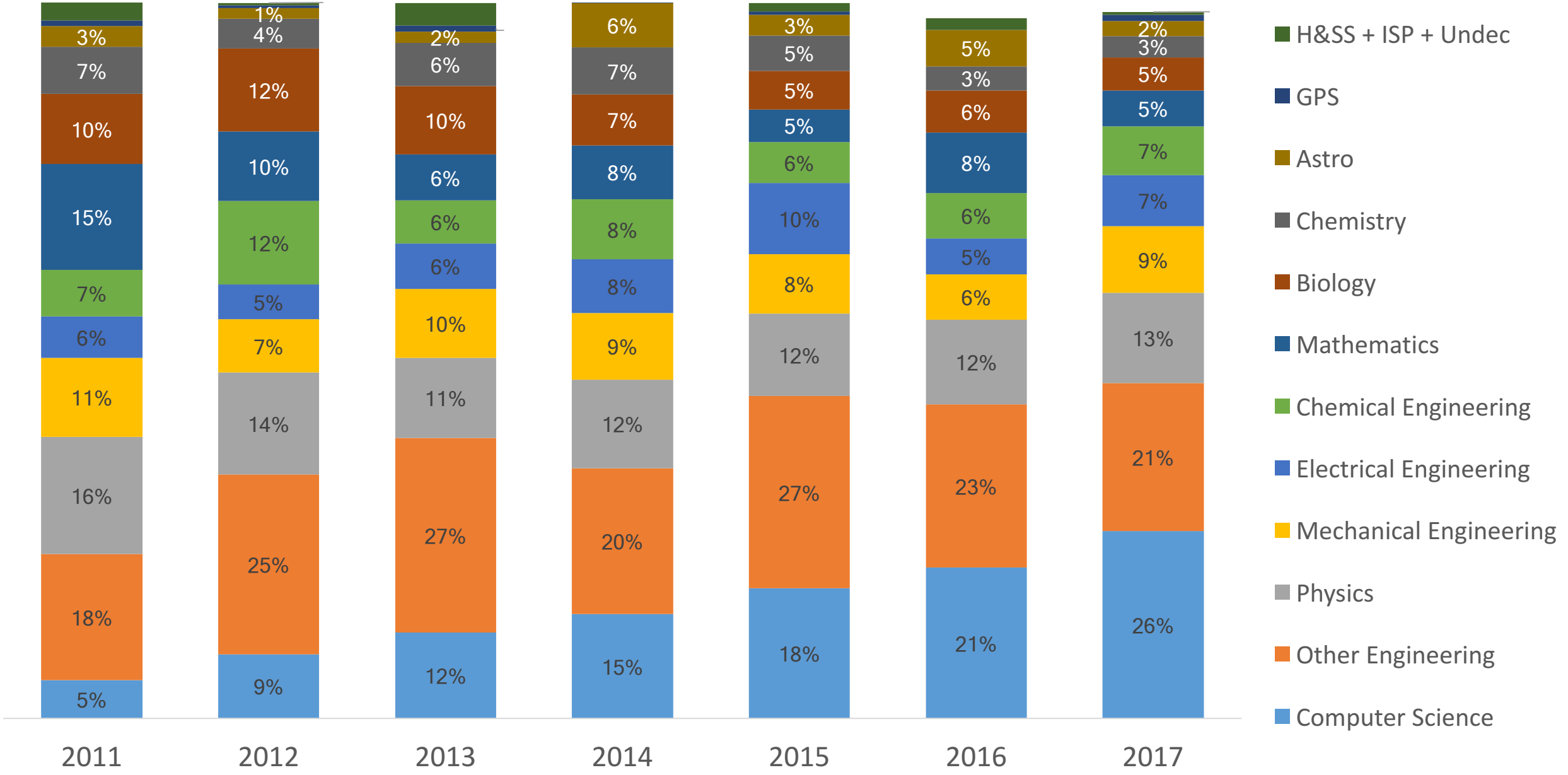
Admission: More competitive than ever

- Number of Applications
  - –7339: 483 (7%) more than 2016; early action up 13.5% from 2016
- Admissions
  - –568: ***262 early action***, *263 regular (incl. 20 EA holds)*, ***43 wait list***
  - –Admit rate 7.7%, lowest ever
- Yield
  - –237 students: Yield = 41.7% (vs 42.8% last year)
  - –109 women: Yield = 35.6% (vs 38% last year)
  - –128 men: Yield = 48.9% (vs 47.8% last year)

Additional details

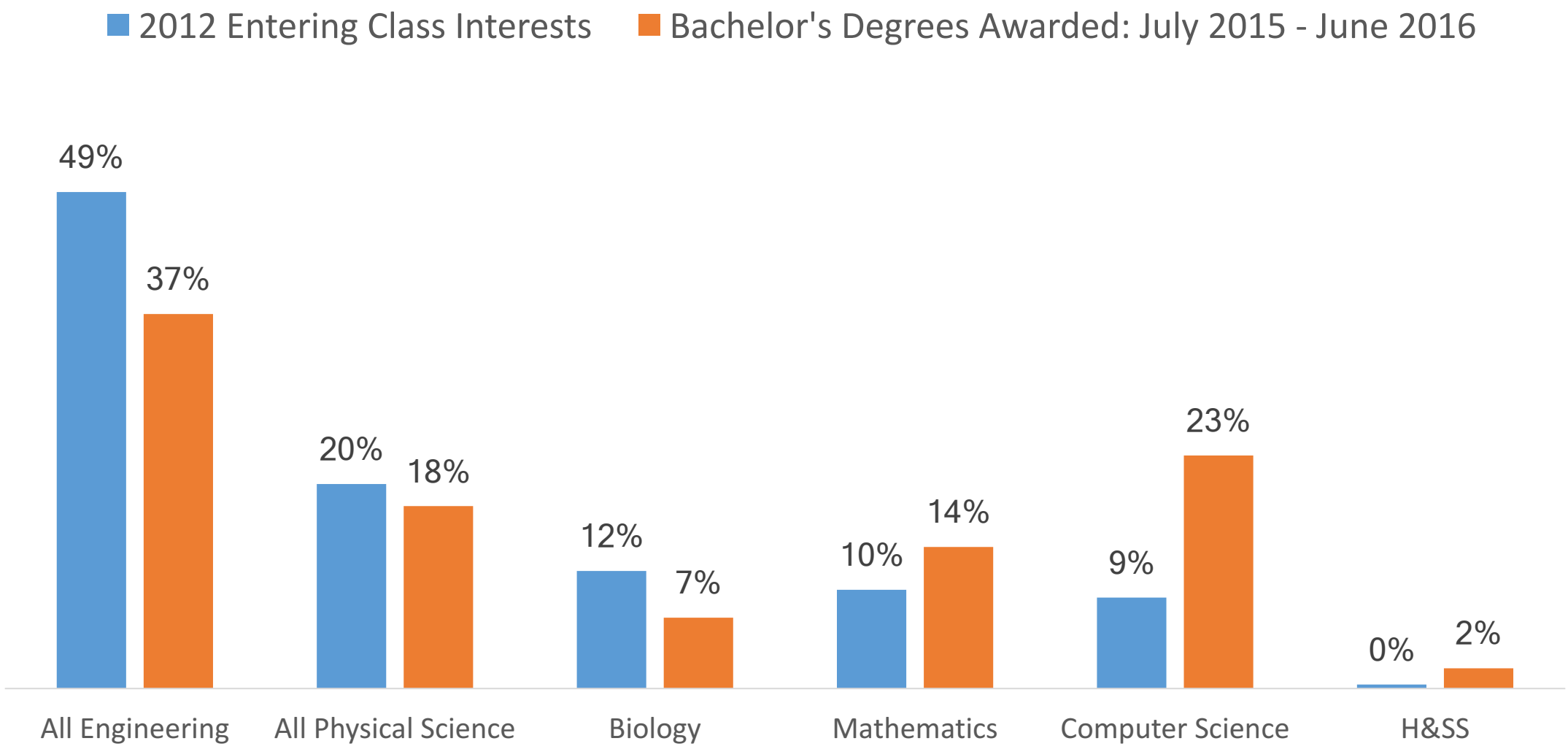
- Caltech is the first choice school for ~58% of entering students
- Top reasons why students choose Caltech:
  - We have a very good academic reputation
  - Our graduates make a difference in the world
  - Our graduates gain admission to top graduate/professional schools
  - Our graduates get good jobs

Matriculating students' academic interests have changed over time



Data source: admissions

Caltech students' academic interests change while they are here



Data sources: admissions and Common Data Set

The Class Entering in Fall 2017

- 237 Students
- 109 women (46%) vs 105 (44%) in 2016
- URM = 15.6% (17.7% in 2016)
  - 28 Hispanic / Latinos
  - 6 African Americans
  - 3 Native Americans
- 21 International

(27 in 2016, 18 in 2015)

Diversity numbers reflect our admission reporting, not IPEDS guidelines

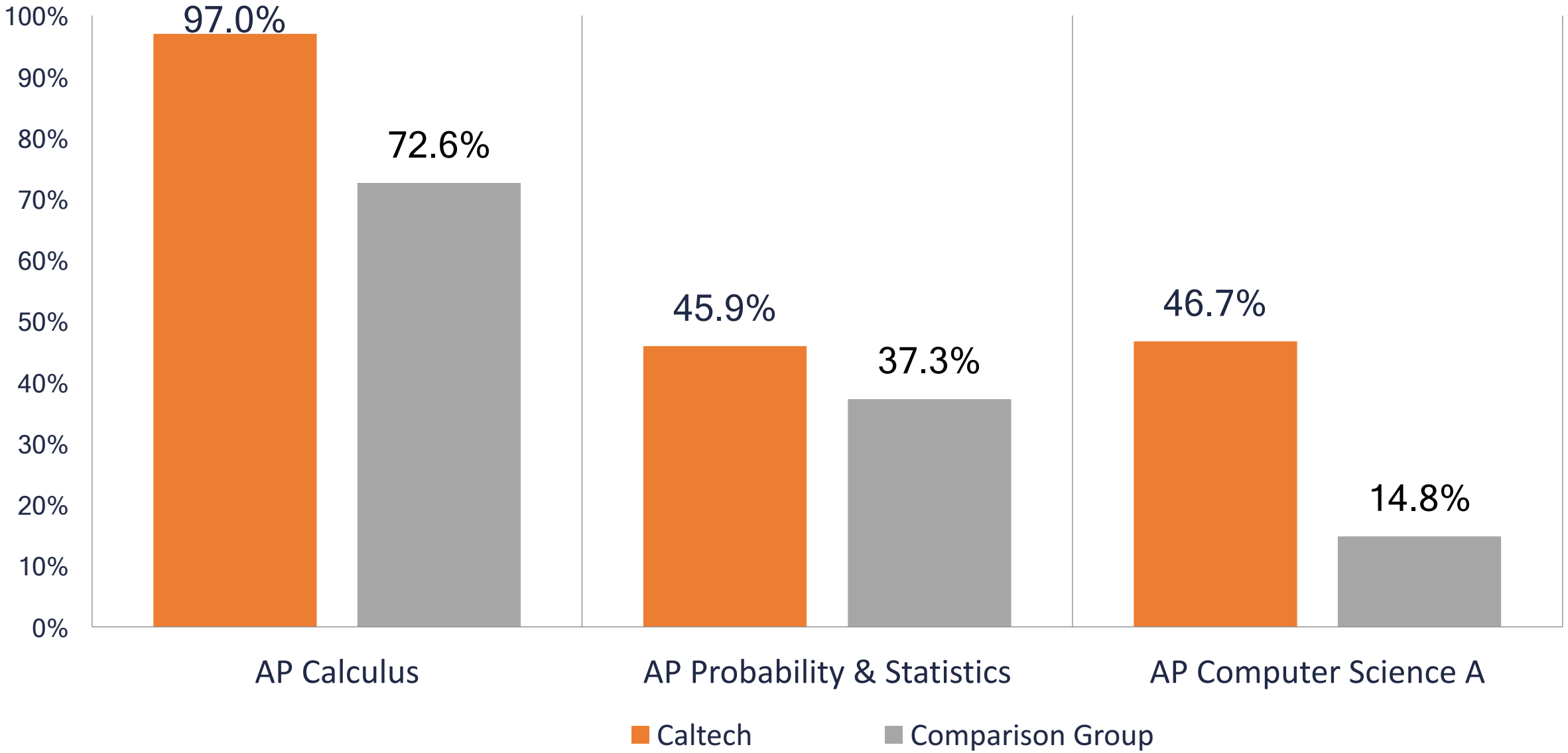
- 71% are from *public or charter high schools*
- 5% are *first generation*
- 11.5% are *Pell eligible*
- 20% are *athletes*
- 14.5% *LGBTQ (self-reported)*

Let’s take a look at some of the data from our incoming freshmen class….

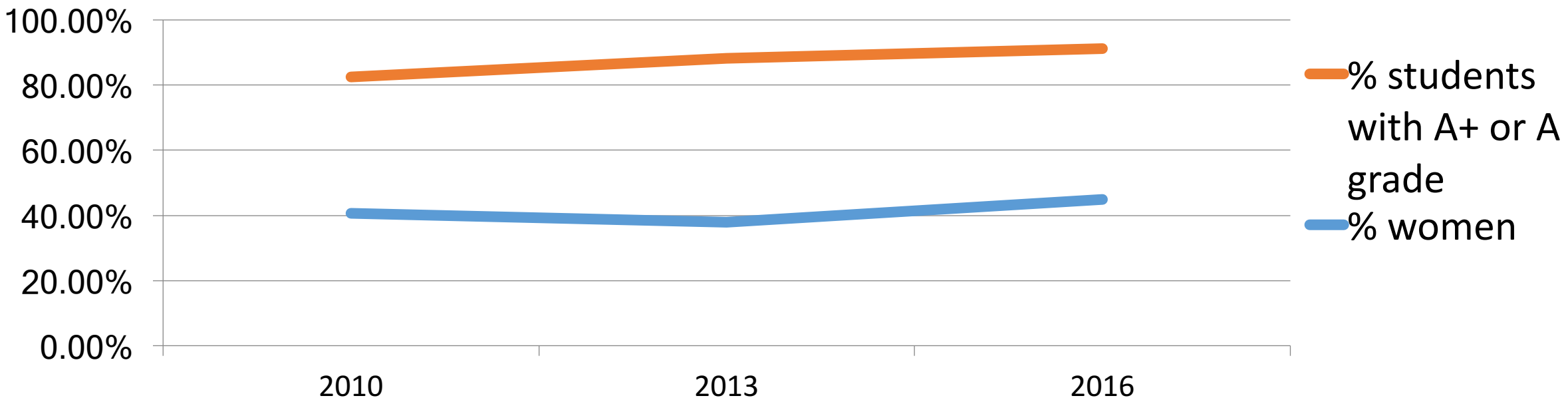
Data Source:

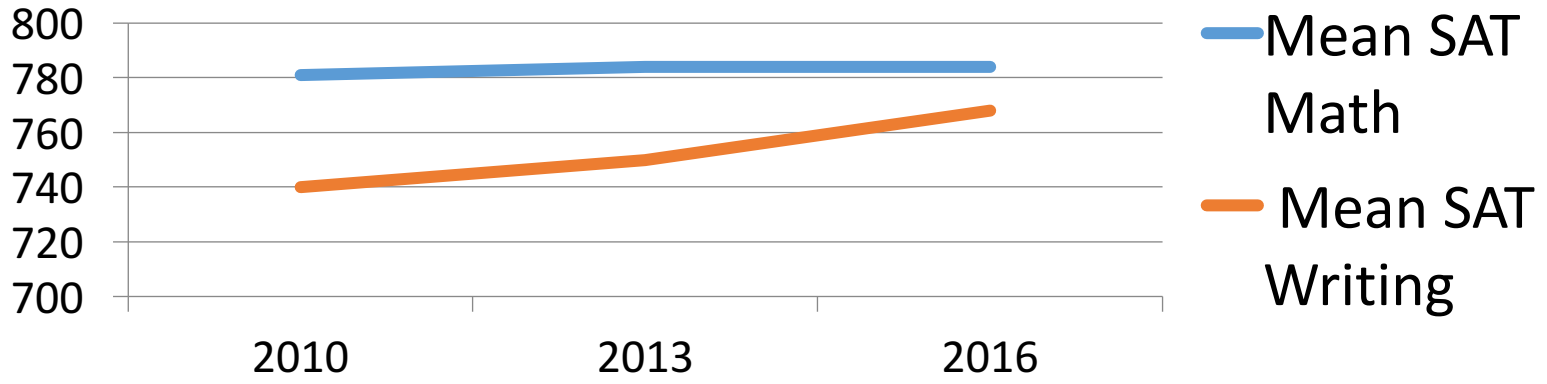
- 2010, 2013, 2016 CIRP Freshman Survey (TFS)
- Completed by incoming freshmen (i.e. self-reported data)
- Caltech + Comparison Group of Private Universities with Very High Selectivity

Caltech students have exceptional pre-college preparation



Trends Over Time



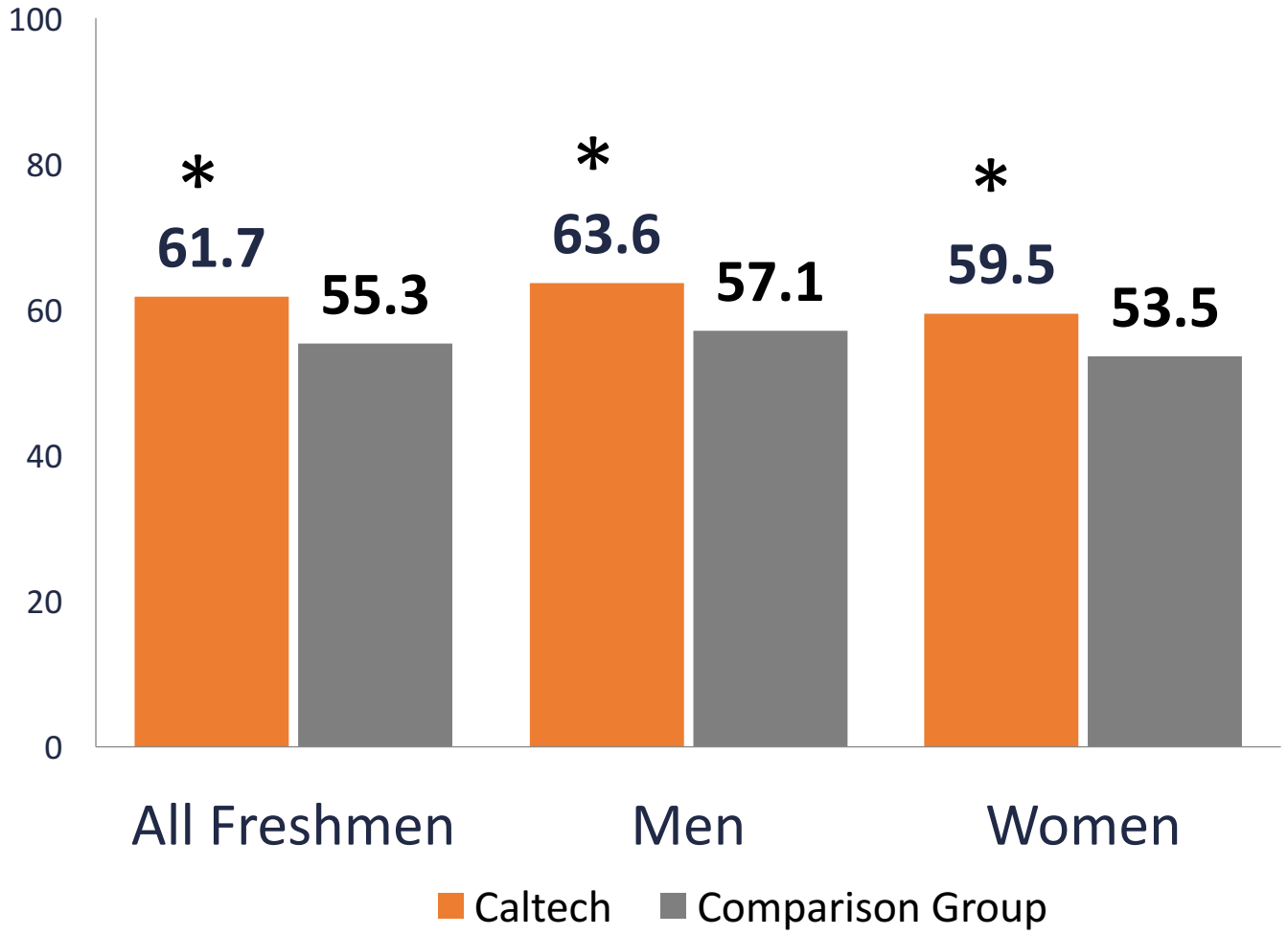


Incoming Caltech students are academically confident with a strong “Academic Self-Concept”

Academic Self-Concept is a unified measure of students’ beliefs about their abilities and confidence in academic environments.

Academic Self-Concept includes:

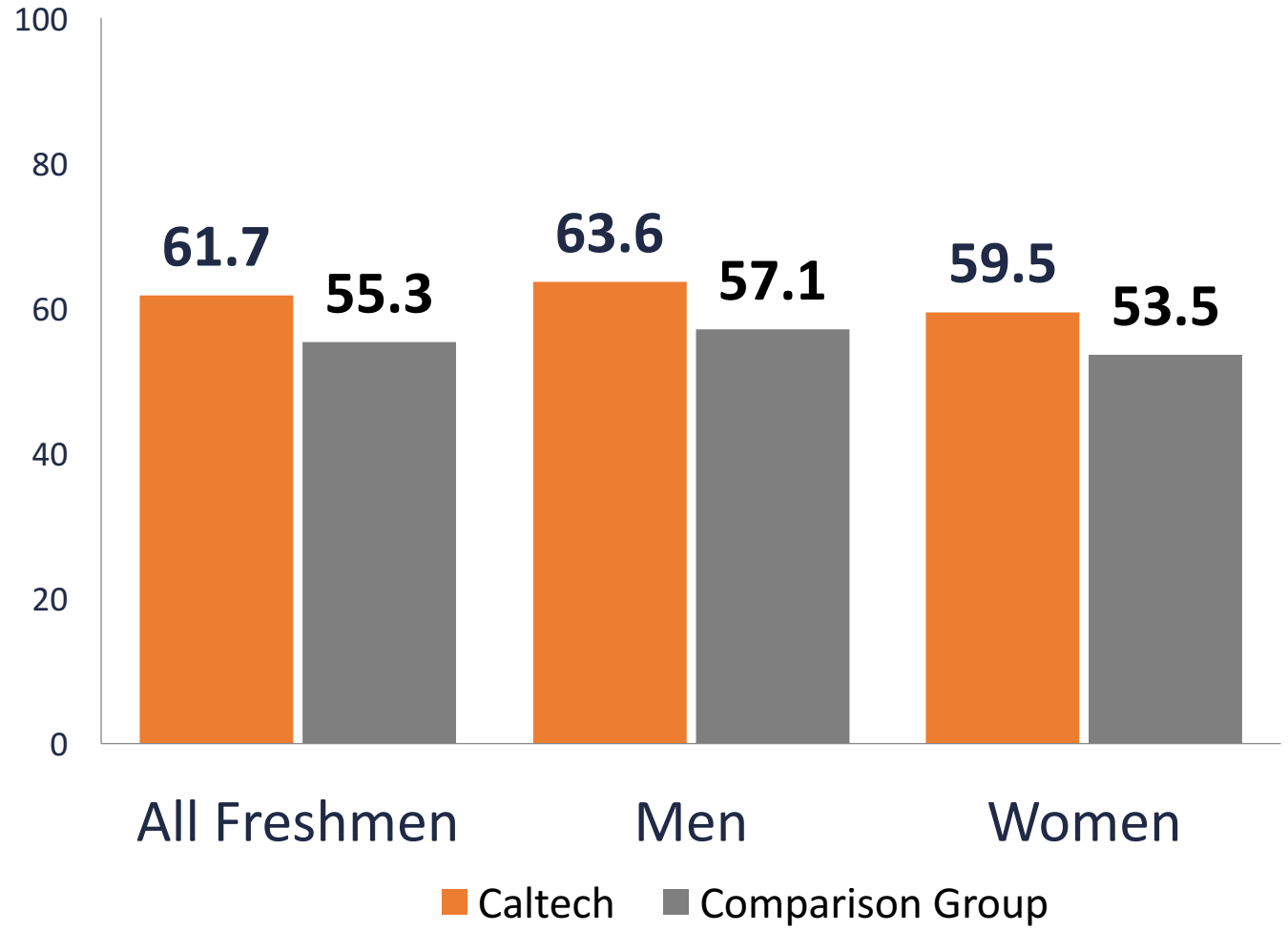
- Self-rated academic ability
- Self-rated mathematical ability
- Self-rated intellectual self-confidence
- Self-rated drive to achieve



Incoming Caltech students are academically confident with a strong “Academic Self-Concept”

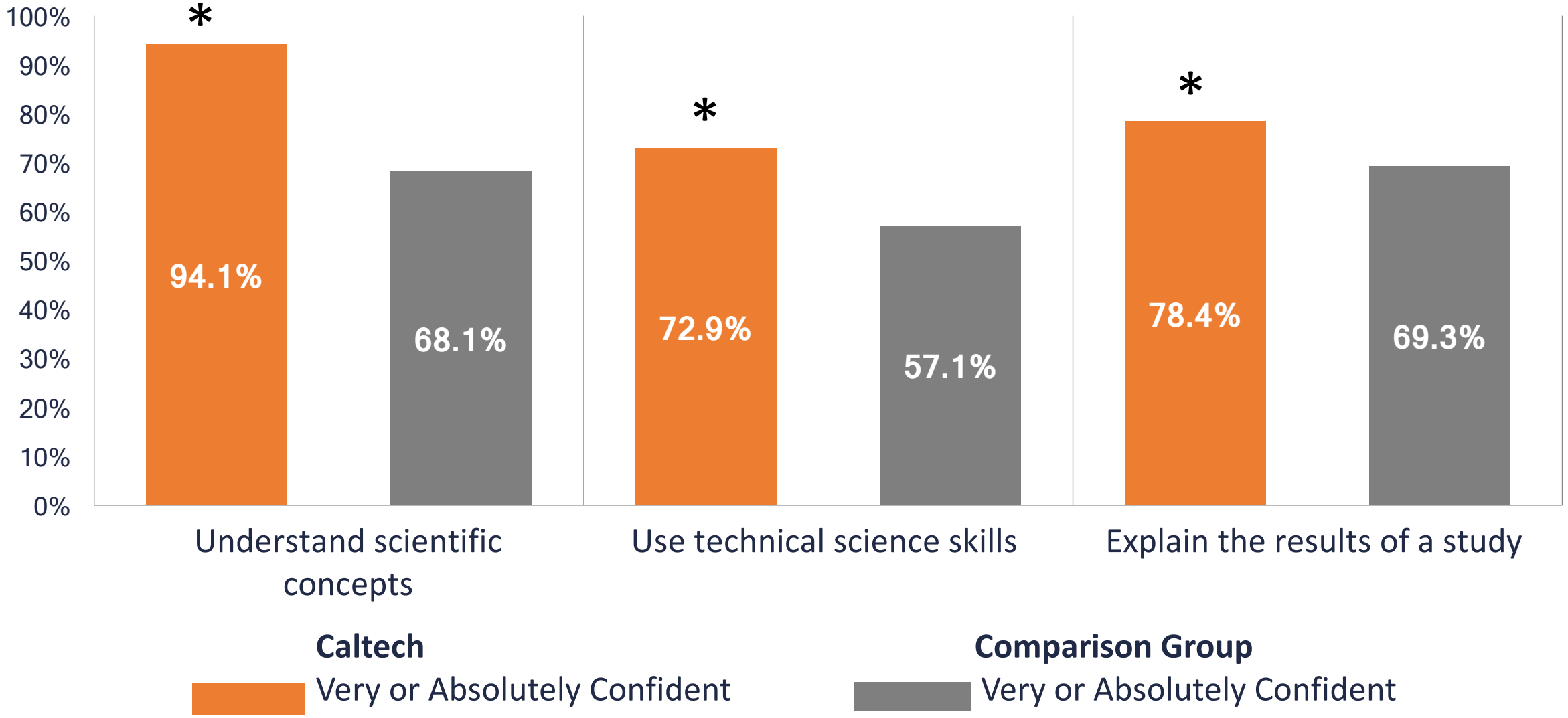
Academic Self-Concept is a unified measure of students’ beliefs about their abilities and confidence in academic environments.

- Significant difference between Whites and non-Whites for Academic Ability and Mathematical Ability
- Significant difference between Genders



Incoming Caltech Students have strong science and research self-efficacy

Survey Question: How confident are you that you can do the following?



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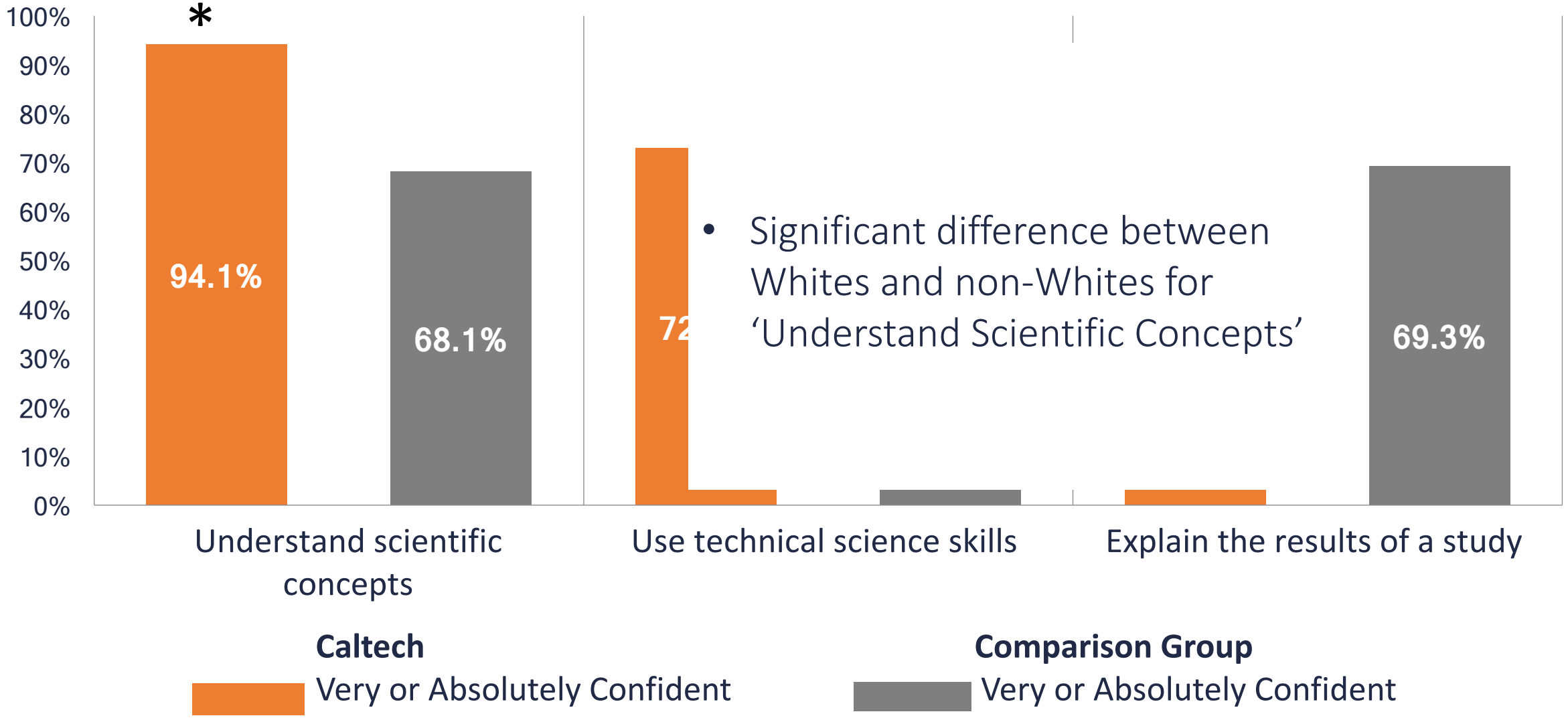
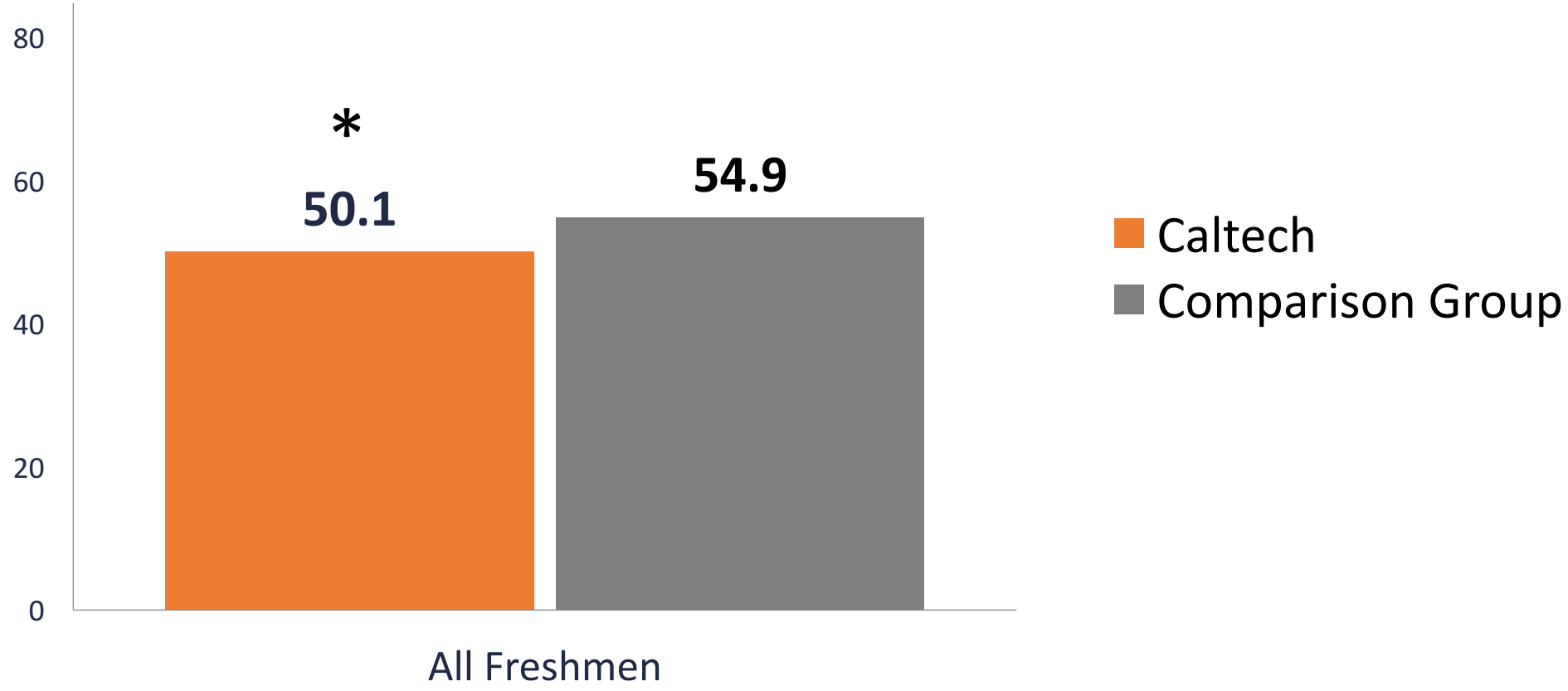


Incoming Caltech students are academically confident with a strong “Academic Self-Concept” *and* have strong science and research self-efficacy

Implications for Learning:
Self-awareness and confidence in academic environments help students learn by encouraging their intellectual inquiry.

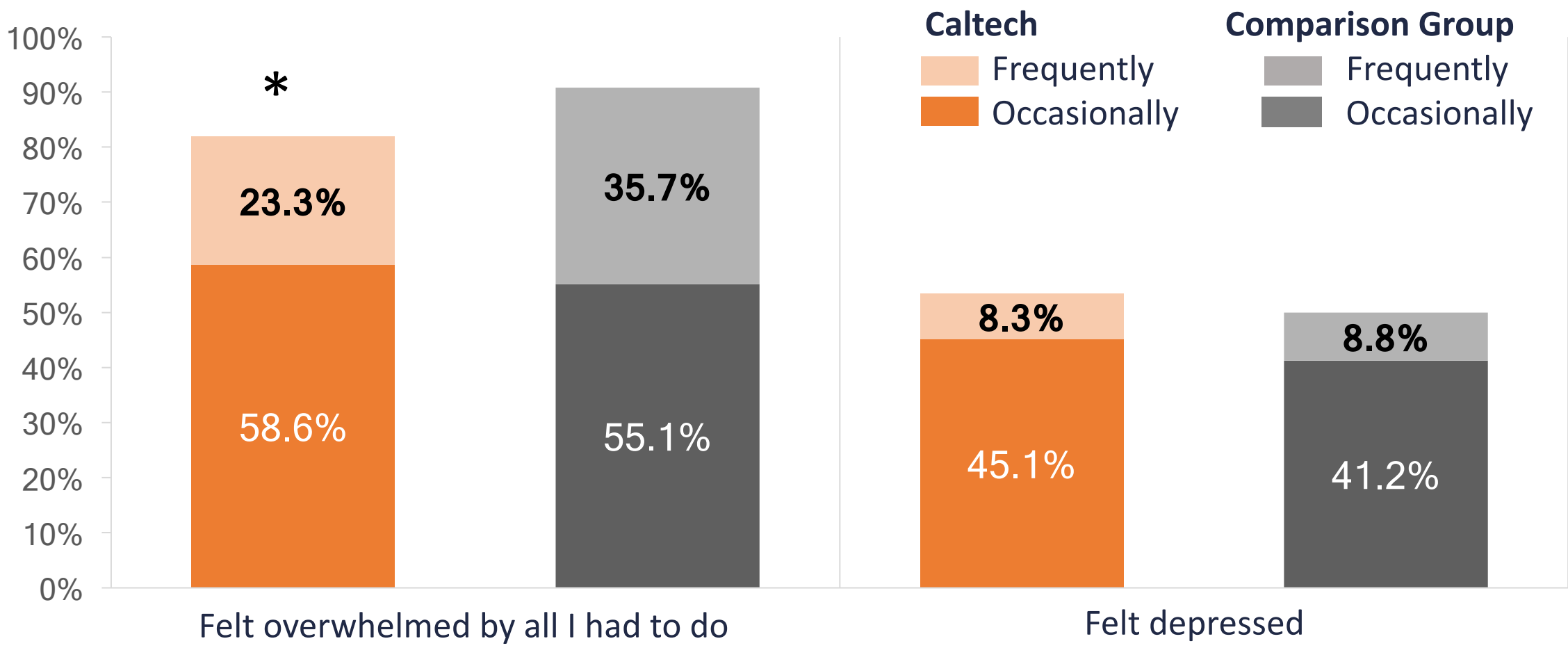
Compared to other institutions, Caltech students begin with less civic engagement

Civic Engagement measures the extent to which students are motivated and involved in civic, electoral and political activities.



Compared to other institutions, Caltech students begin with similar emotional well-being

Survey Question: In the last year, how often have you…

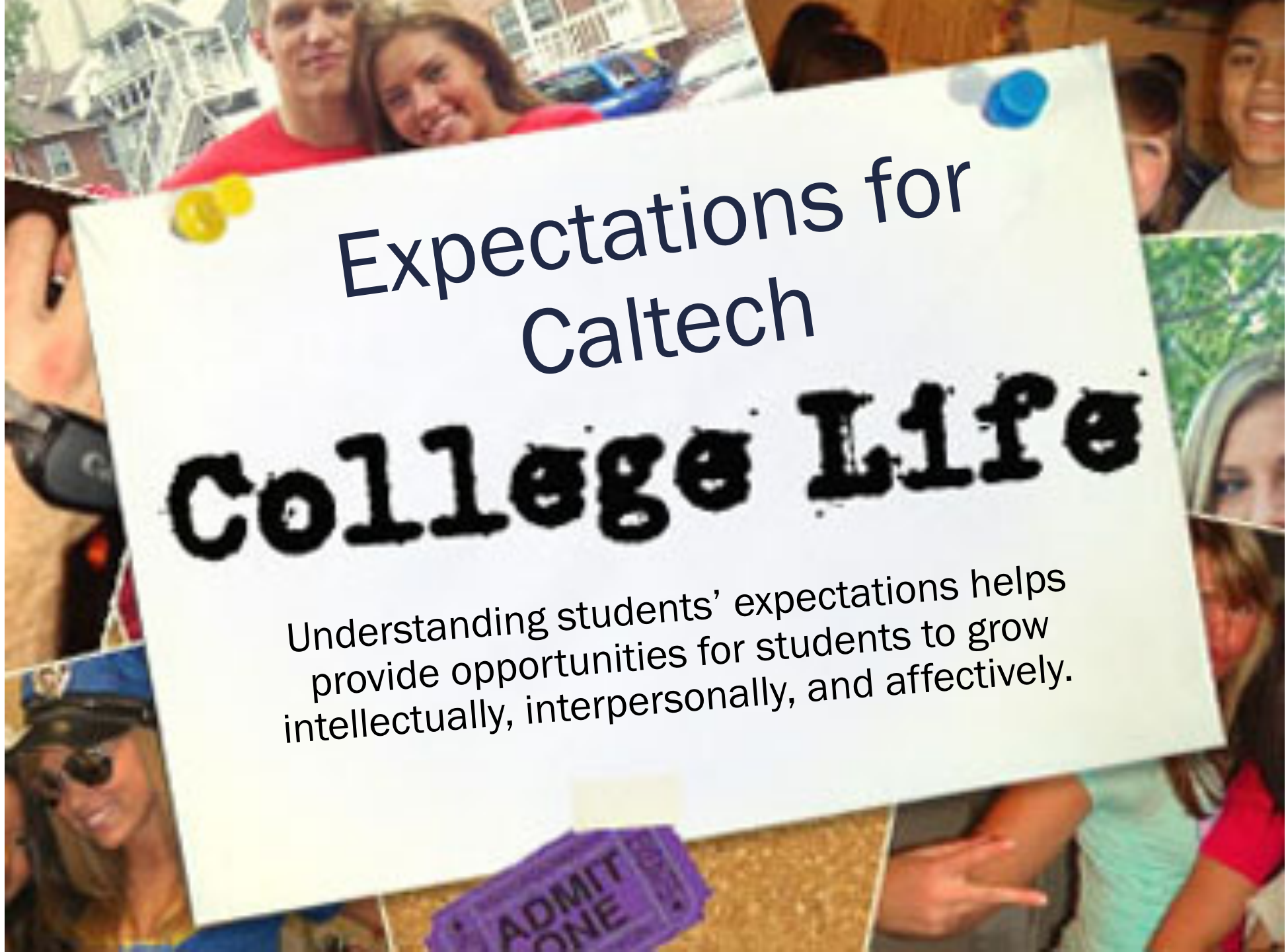


Compared to other institutions, Caltech students begin with less civic engagement and a similar level of emotional well-being

Implications for Teaching and Advising:

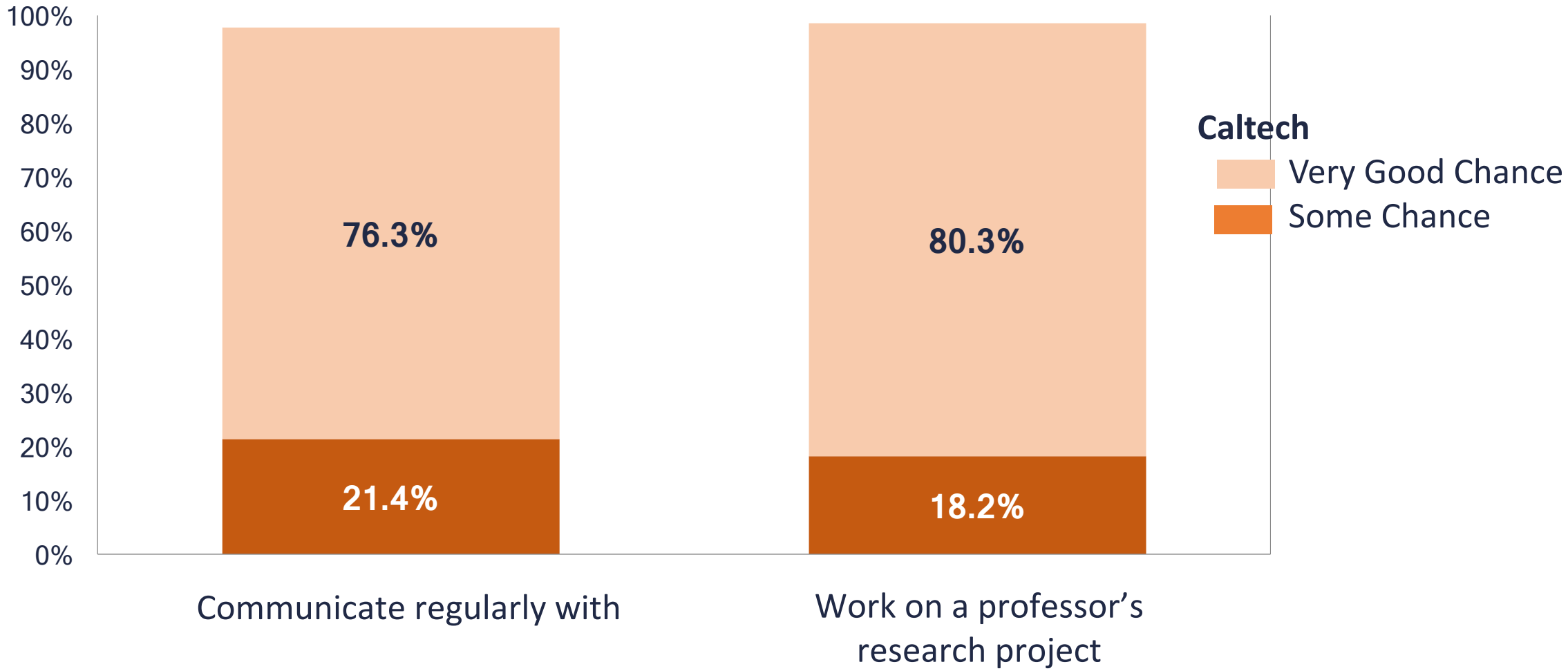
Engaged students have the potential to make a critical difference in our society.

Students' emotional well-being can affect academic performance and persistence.


Expectations for Caltech
College Life
Understanding students' expectations helps provide opportunities for students to grow intellectually, interpersonally, and affectively.
ADMIT ONE

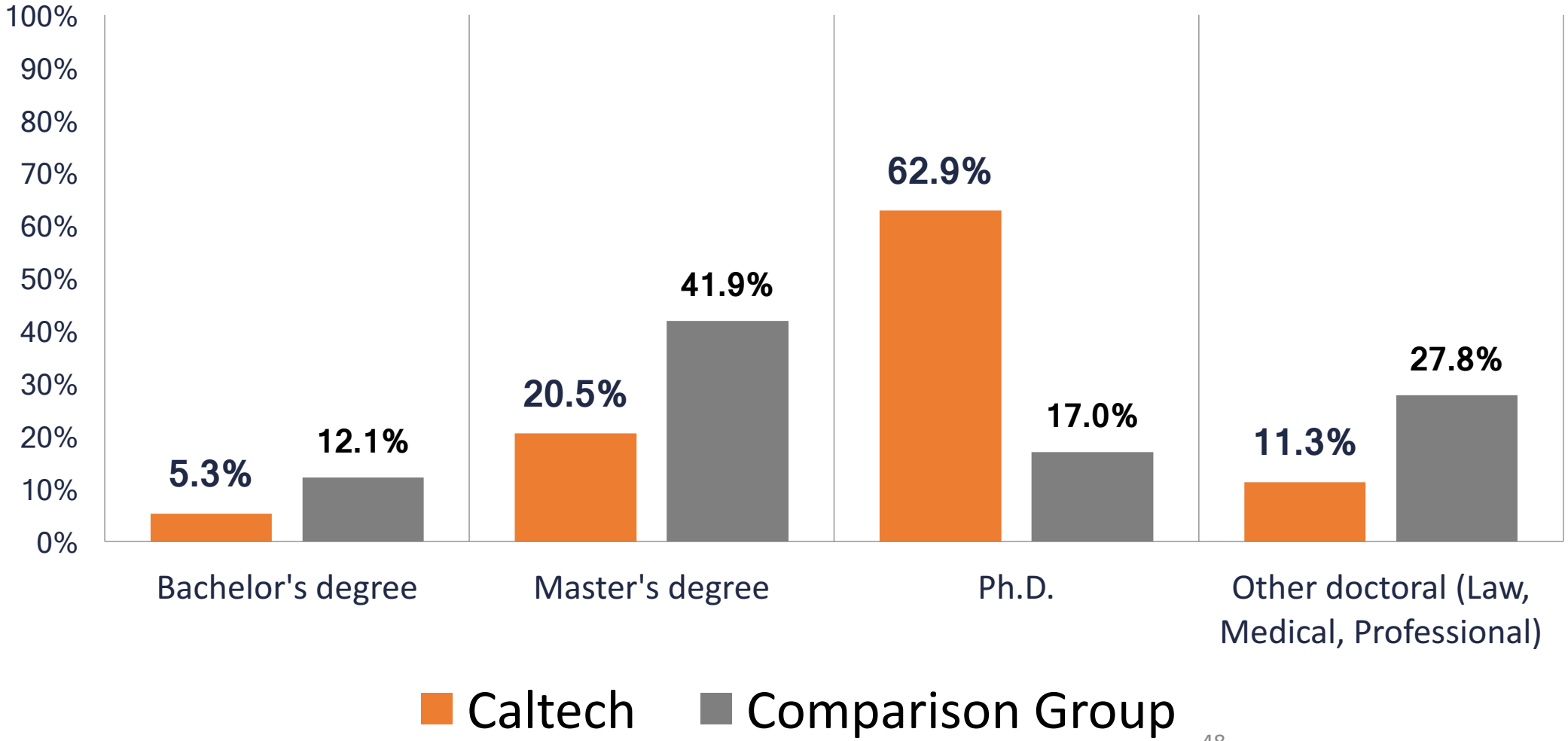
Incoming Caltech students expect to communicate and do research

Survey Question: What is your best guess as to the chances you will:



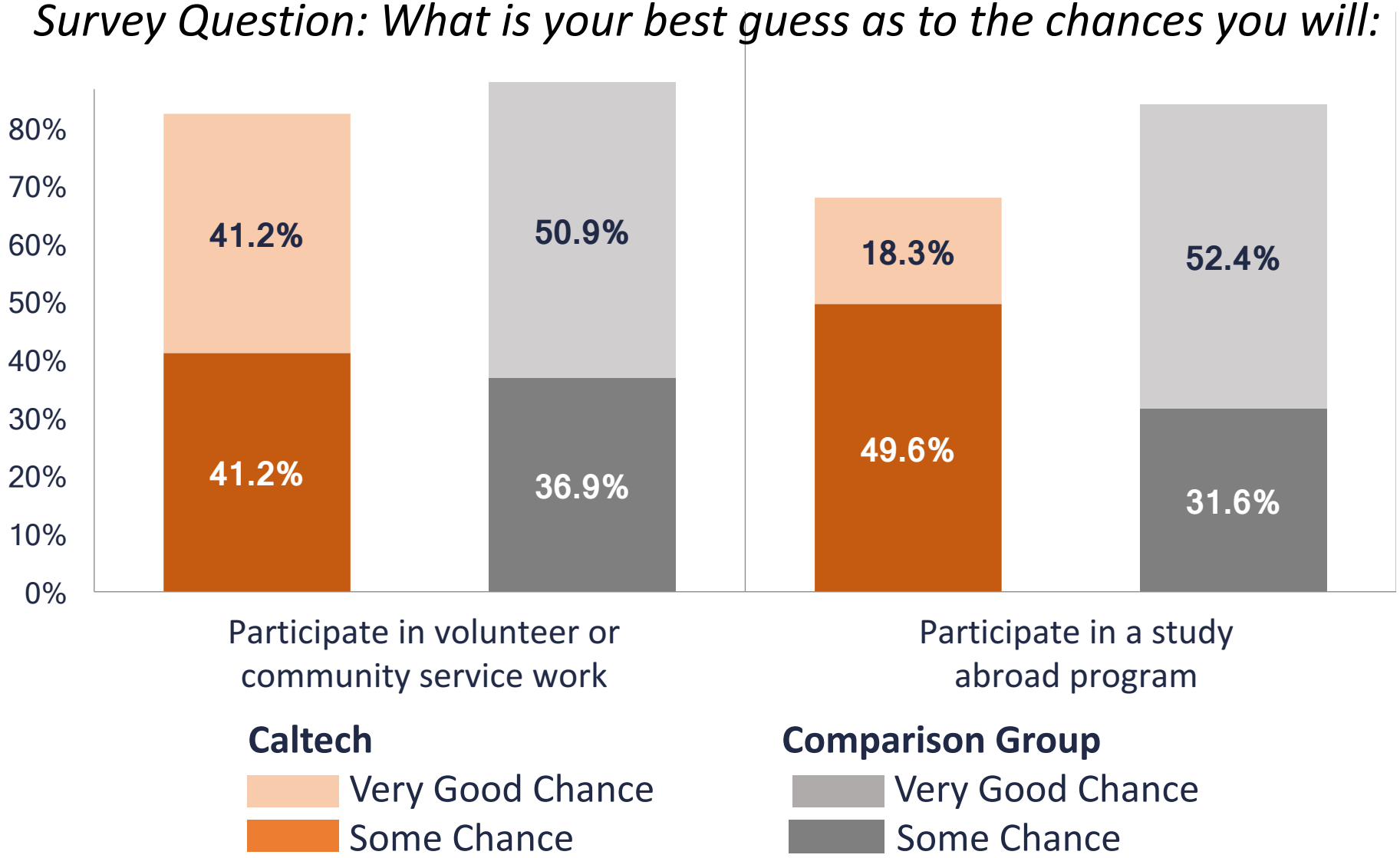
And incoming Caltech students also expect to pursue advanced degrees

Survey Question: What is the highest academic degree that you intend to attain?



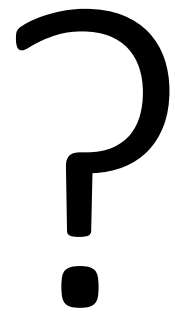
Finally, in comparison to other institutions, fewer Caltech students expect to volunteer or study abroad

Survey Question: What is your best guess as to the chances you will:



Our incoming students…

- Are as qualified, or more so, than ever before to be students at Caltech
- Are becoming more diverse, while still meeting and exceeding Caltech's high standards
- Begin with strong academic confidence compared to students at other institutions
  - *With a few notable differences between women and men*



With respect to incoming students…

what stands out to you from the data?

what have you noticed in your experience teaching or advising?

and in light of these patterns, what strategies can we use to effectively teach and advise freshmen?

Up next:

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Practices, Tools, and Evidence for Improving Large Introductory Science and Math Courses (part 1)

12:00 Lunch Buffet (Annenberg 106)

12:15 Breakouts: *Please take lunch to one of the following*
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- Annenberg 213: Freshman Advisors

References: Generation Z (from Hanna Song)

- Benhamou, L. Everything you need to know about Generation Z. Business Insider, 2015.
- Beswick, C. Thinking Differently about the Generation Z Innovation Challenge. 2014.
- Commando, J. 5 things to know about the class of 2021. 2016. https://gocommandoapp.com/blog/5-things-know-class-2021/
- Coyle, D. Meet Generation Z. Presentation: June 4, 2015.
- The Mindset List. Beloit College. Updated annually. https://www.beloit.edu/mindset/

Supplemental slides and data

In addition, compared to other institutions, Caltech students…

- Have slightly stronger "habits of mind"

  Behaviors and traits associated with academic success, like logical argument, seeking alternative solutions to problems, evaluating information, asking questions, taking risks, exploring topics on one's own, accepting mistakes as part of learning, analyzing multiple sources of information before coming to a conclusion

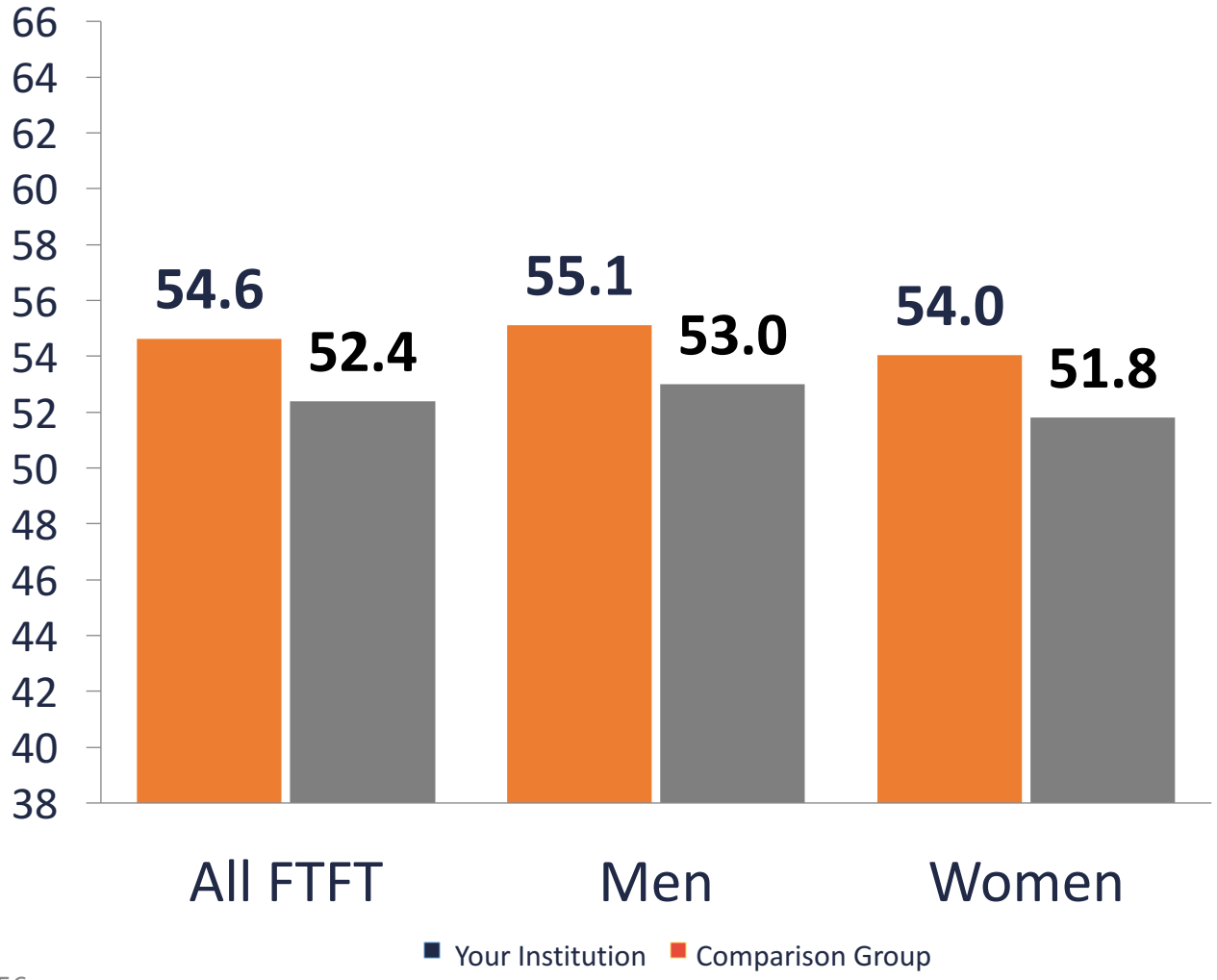
- Have slightly lower "pluralistic orientation"

  Skills and dispositions appropriate for living and working in a diverse society, such as tolerance of others with different beliefs, ability to work cooperatively with diverse people, ability to discuss and negotiate controversial issues, openness to having views challenged, ability to see the world from someone else's perspective

SUPPLEMENTAL SLIDE: NOT SHOWN IN PRESENTATION

Incoming Caltech Students: Strong "Habits of Mind," similar by gender

Habits of Mind is a unified measure of the behaviors and traits associated with academic success. These learning behaviors are seen as the foundation for lifelong learning.



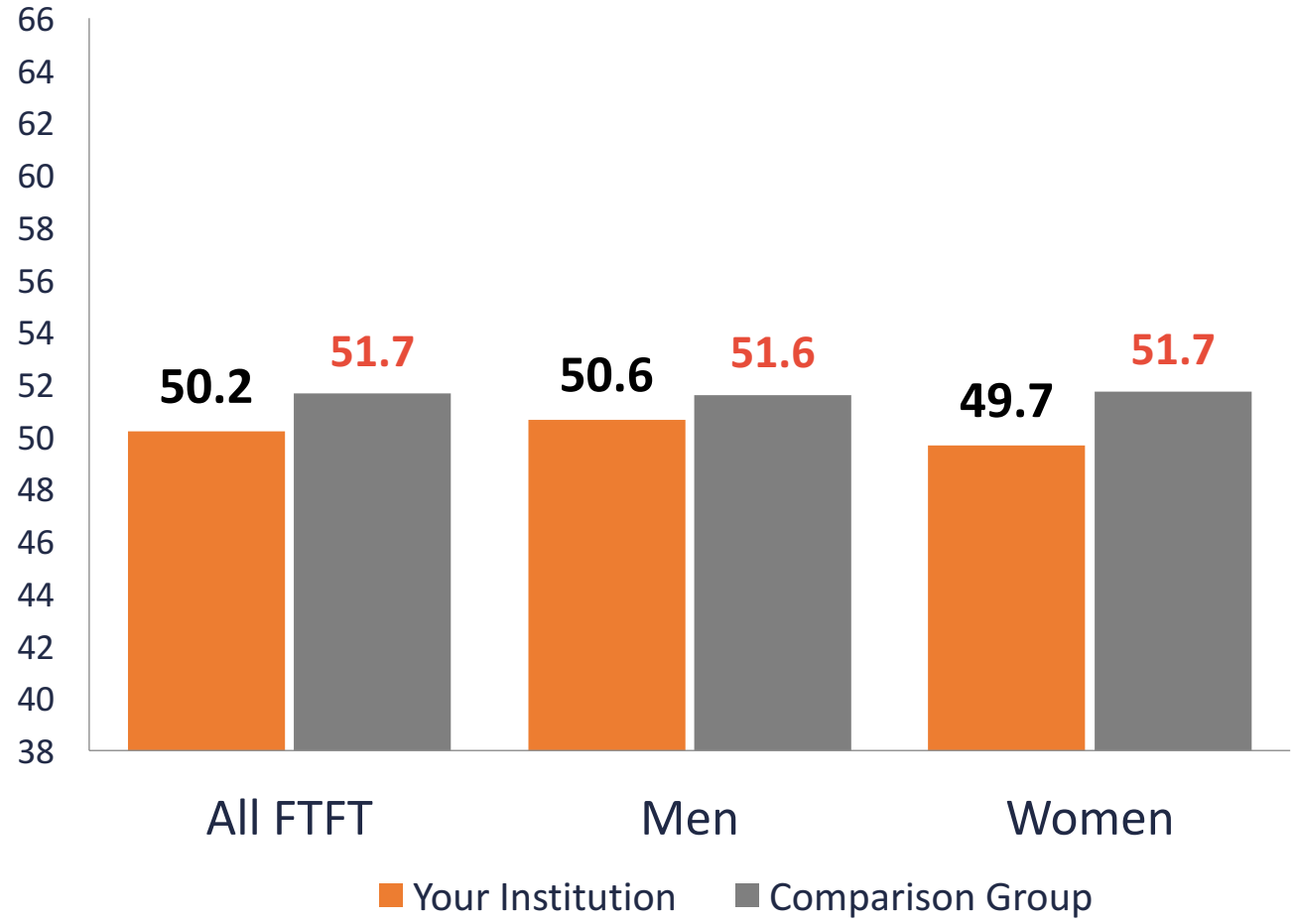
Construct Items

- Support your opinion with a logical argument
- Seek solutions to problems and explain them to others
- Seek alternative solutions to a problem
- Evaluate the quality or reliability of information you received
- Ask questions in class
- Take a risk because you felt you had more to gain
- Explore topics on your own, even though it was not required for a class
- Accept mistakes as part of the learning process
- Look up scientific research articles and resources
- Analyze multiple sources of information before coming to a conclusion
- Take on a challenge that scares you

SUPPLEMENTAL SLIDE: NOT SHOWN IN PRESENTATION

Caltech Incoming Students: somewhat low but similar "Pluralistic Orientation," similar by gender

Pluralistic Orientation measures skills and dispositions appropriate for living and working in a diverse society.

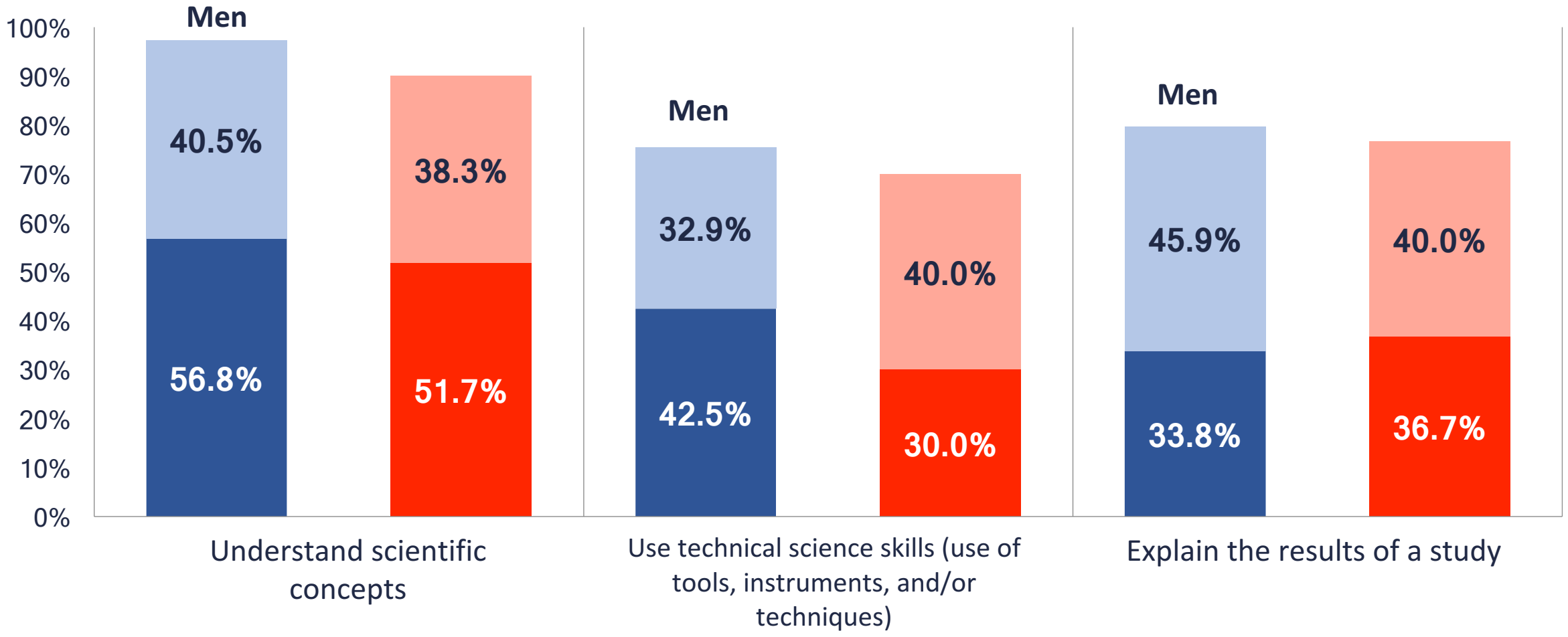


Construct Items

- Tolerance of others with different beliefs
- Ability to work cooperatively with diverse people
- Ability to discuss and negotiate controversial issues
- Openness to having my views challenged
- Ability to see the world from someone else's perspective

SUPPLEMENTAL SLIDE: NOT SHOWN IN PRESENTATION

Caltech students' science/research self-efficacy is a little stronger among men than among than women



Expectations: Major

Please indicate your intended major.

	Caltech	Comp Group
Agriculture	0.0%	0.1%
Biological & Life Sciences	11.8%	16.3%
Business	0.0%	16.8%
Education	0.0%	1.0%
Engineering	27.2%	15.5%
English	0.0%	1.2%
Health Professions	0.0%	4.5%
History or Political Science	0.7%	4.8%
Arts & Humanities	0.0%	5.2%

	Caltech	Comp Group
Fine Arts	0.0%	4.6%
Mathematics or Computer Science	27.2%	8.3%
Physical Science	26.5%	3.1%
Social Science	0.0%	7.7%
Justice and Security	0.0%	0.2%
Library Science	0.0%	0.0%
Other Non-technical	0.0%	2.0%
Undecided	6.6%	8.9%

Expectations: Career

Please indicate your intended career.

	Caltech	Comp Group
Agriculture/Natural Resources	0.0%	0.4%
Artist	0.0%	6.0%
Business	5.2%	19.7%
Business (Admin Assistant)	0.0%	0.1%
Clergy	0.0%	0.1%
College Faculty	5.2%	0.5%
Communications	0.0%	2.1%
Doctor (MD or DDS)	6.0%	16.8%
Education (elementary/secondary)	0.7%	2.2%
Engineer	21.6%	10.9%
Government	0.0%	1.9%
Health Professional	0.0%	3.7%
Homemaker/Stay-at-Home Parent	0.0%	0.2%
Information Technology Professional	10.4%	5.0%
Lawyer	0.0%	4.7%
Military	0.0%	0.5%
Nurse	0.0%	0.4%
Research Scientist	35.8%	5.0%
Service Industry	0.0%	0.1%
Skilled worker	0.0%	0.0%
Social/Non-Profit Services	0.0%	0.4%
Other	0.7%	5.2%

SUPPLEMENTAL SLIDE: NOT SHOWN IN PRESENTATION
Class of 2021

Enrolling Testing Profile

Test	Mid-50%		Test (new)	Mid-50%
SAT CR	740-800		SAT EBRW	730-770
SAT Math	770-800		SAT Math	780-800
SAT Writing	730-800			
Math L2	800-800			
Physics	780-800			
Chemistry	770-800			
Biology	770-780			
ACT Comp	34-35			
ACT English	34-36			
ACT Math	35-36			
ACT Read	33-36			
ACT Sci	34-36			

SUPPLEMENTAL SLIDE: NOT SHOWN IN PRESENTATION

Graduation Rates