

Mathematics for Social Justice: Lessons from within a Mile Range Radius

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Social Justice

$$\frac{dS}{dt} = T_0 q_0 (N - N_0) (1 - \epsilon S) S + \frac{T_0 N}{T_m} - \frac{S}{T_p}$$

$$\frac{S}{P_k} = \frac{T_p \lambda_0}{T_0 + \eta \mu c} = \odot$$

$$|S| \leq \frac{1}{\epsilon}$$

$$P_k =$$

What does it mean to you?

In this session...

- Ways to leverage what's within a mile-range radius from a given location
- Ways to empower students through intentional, imperative, and interconnected math experiences



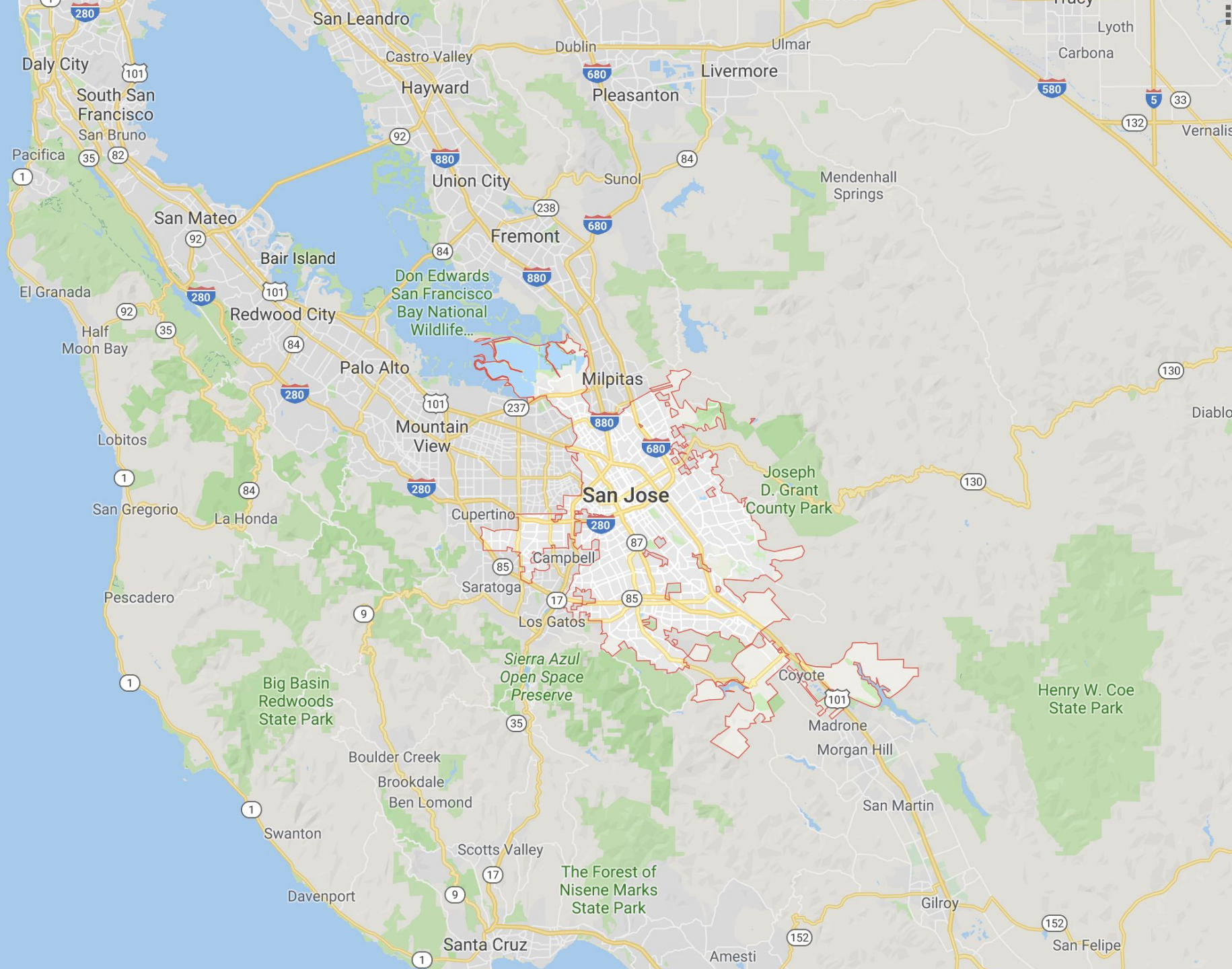
What's going on in this picture?

Inspired by: <https://www.nytimes.com/column/learning-whats-going-on-in-this-picture>

Visual Thinking Strategies

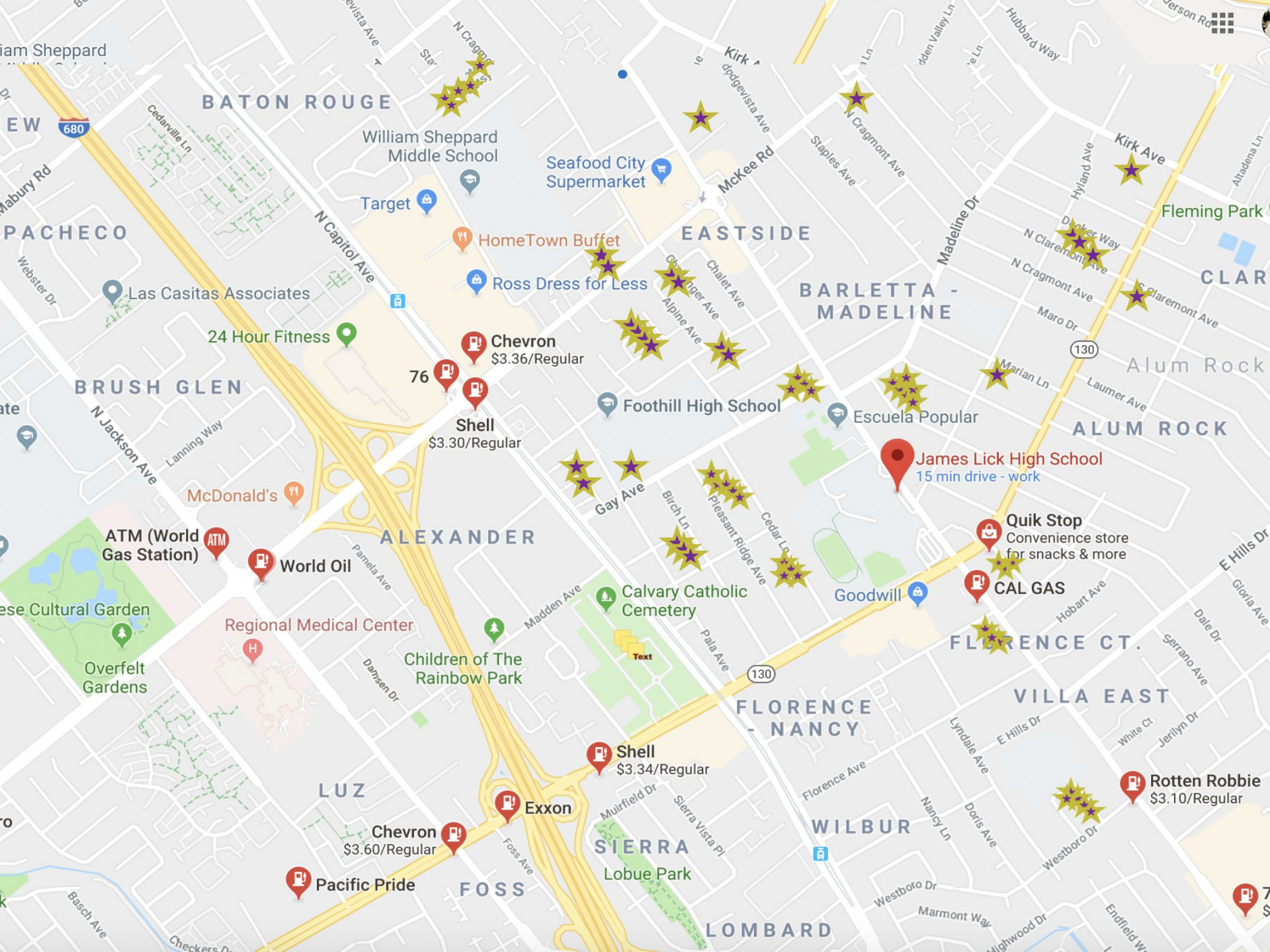
“We believe thoughtfully facilitated discussions of art [or math] make education more engaging, inclusive, and equitable.”

- VTS <https://vtshome.org/>



Context





2016 - 17 ESUHSD Demographics

	% of Population	# of Students
Am Indian/Alskn Nat	0.2%	56
Asian	43.4%	10,109
Black/African Am	2.6%	600
Hispanic	45.6%	10,609
Two or More Races	1.8%	428
Nat Hwiin/Othr Pac Islndr	0.5%	125
White	5.8%	1,360
Socioeconomically disadvantaged	53.5%	12,448
Foster Youth	0.3%	80
Students with Disabilities	10.6%	2,457
English Langage Learner	15.8%	3,669
Total District Enrollment		23,287



2017-18 Student Enrollment by Group

Group	Percent of Total Enrollment
Black or African American	2.3
American Indian or Alaska Native	0.5
Asian	6.5
Filipino	6.9
Hispanic or Latino	79.3
Native Hawaiian or Pacific Islander	0.7
White	3.3
Socioeconomically Disadvantaged	86.3
English Learners	20.3
Students with Disabilities	15.4
Foster Youth	0.4

James Lick High School

School Year 2017-18 CAASPP Assessment Results - Mathematics Disaggregated by Student Groups, Grades Three through Eight and Eleven

Student Group	Total Enrollment	Number Tested	Percent Tested	Percent Met or Exceeded
All Students	258	242	93.8	18.18
Male	144	133	92.36	16.54
Female	114	109	95.61	20.18
Black or African American	--	--	--	--
American Indian or Alaska Native	--	--	--	--
Asian	15	15	100	53.33
Filipino	11	10	90.91	40
Hispanic or Latino	210	196	93.33	13.78
Native Hawaiian or Pacific Islander	--	--	--	--
White	--	--	--	--
Socioeconomically Disadvantaged	199	184	92.46	17.39
English Learners	60	54	90	3.7
Students with Disabilities	35	29	82.86	0
Students Receiving Migrant Education Services	--	--	--	--
Foster Youth	--	--	--	--



The Lesson



Launch: Which One Doesn't Belong? Why?

4.3

5

19

748



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Context: Which One Doesn't Belong? Why?

4.3

Bay Area GDP grew by 4.3%
from 2014 - 2017

5

CA is the 5th largest economy
in the world surpassing UK

19

The Bay Area is the 19th
largest economy in the world

748

\$748 billion is the Bay Area's
GDP



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A regional economy that is still strong and growing



July 2018

Continuing Growth and Unparalleled Innovation

Bay Area Economic Profile

Tenth in a Series



Task: Social Issues

- I notice...I wonder...
- Who are represented in the data?Where am I in the data?
- I used to think... now I think...

Global

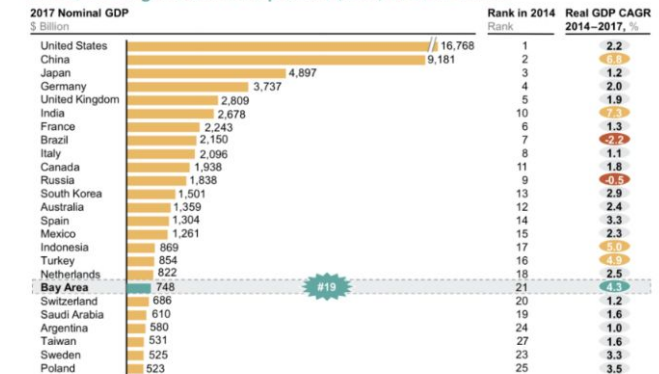
What's going on in San Jose?

Image 1

A Regional Economy That Is Still Strong and Growing

EXHIBIT 1

If it were a country, the Bay Area would be the 19th largest economy in the world, with a gross domestic product (GDP) of \$748 billion.



Notes: The Bay Area is defined as the combined San Jose-Sunnyvale-Santa Clara, San Francisco-Oakland-Hayward, Napa, Santa Rosa, and Vallejo-Fairfield MSAs. The 21-county Northern California Megaregion would have the 16th largest economy at \$952 billion.
Sources: Global Insight, BEA
Analysis: Bay Area Council Economic Institute and McKinsey & Company

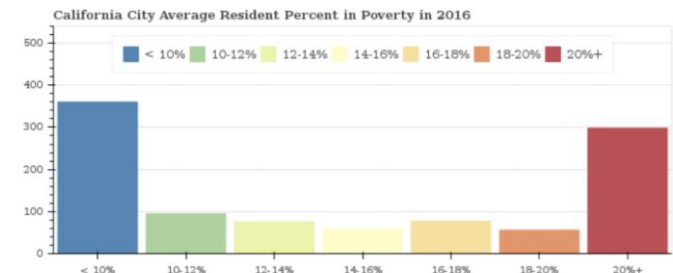
Local

Image 2

Poverty Rate in San Jose, California

The poverty rate in San Jose is 10.9%.

San Jose is in Santa Clara County.



Here is a comparison of Poverty Rate by city (minimum 1,000 residents) in Santa Clara County.

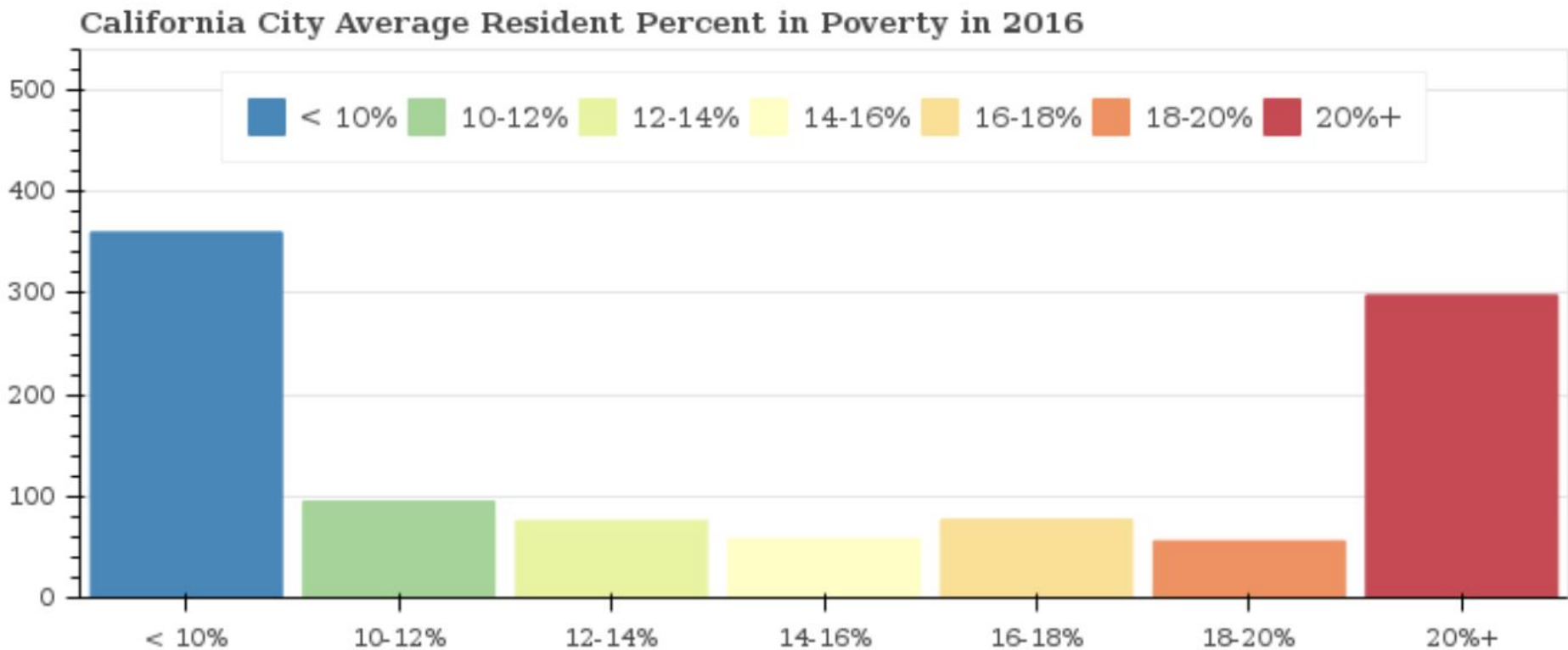
<https://www.wellfareinfo.org/poverty-rate/california/san-jose>



Poverty Rate in San Jose, California

The poverty rate in San Jose is 10.9%.

San Jose is in [Santa Clara County](#).



Here is a comparison of Poverty Rate by city(minimum 1,000 residents) in Santa Clara County.

Taiwan	531	27	1.6
Sweden	525	23	3.3
Poland	523	25	3.5

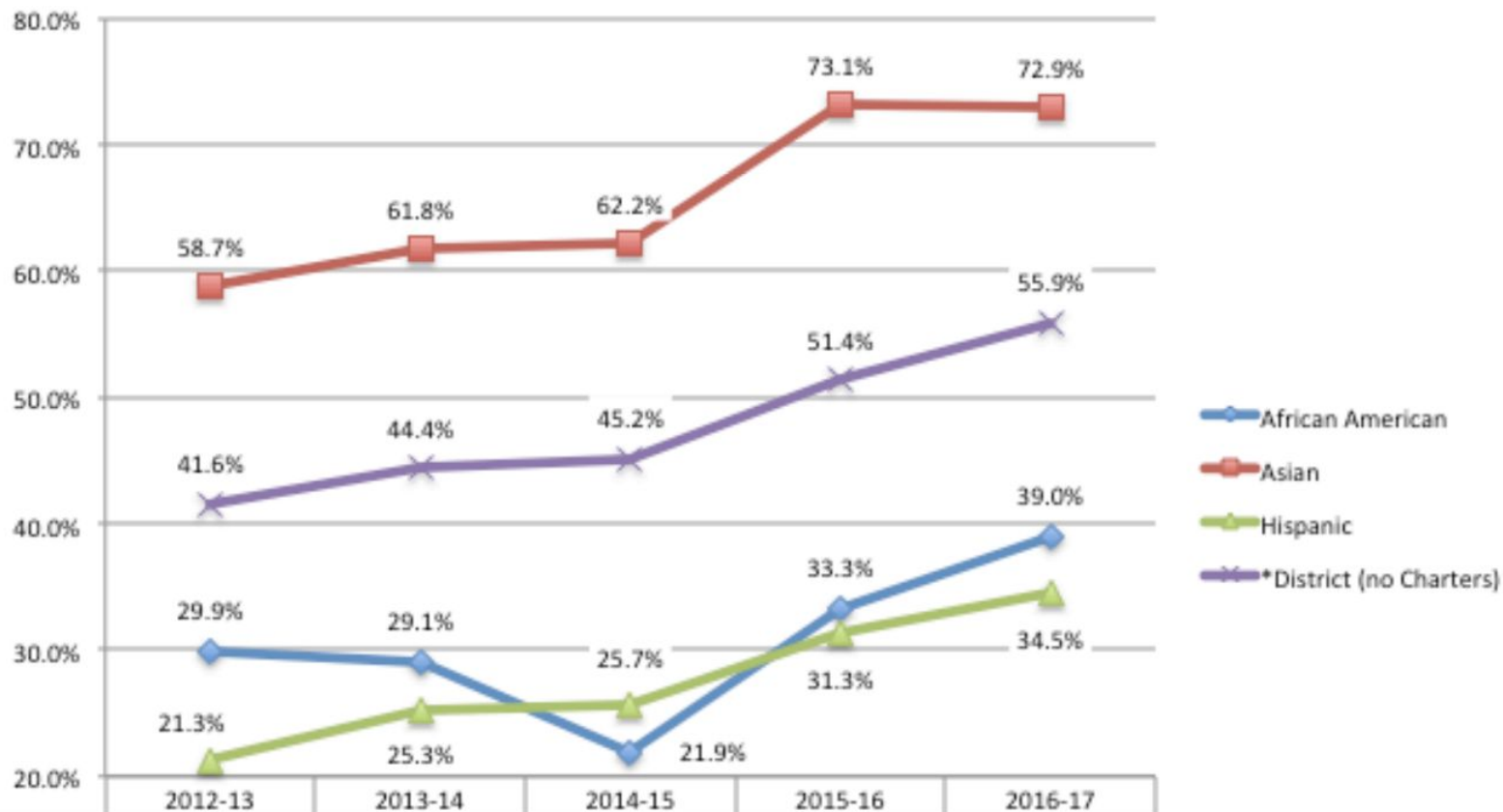
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2013-2017 ESUHSD Local Cohort UC/A-G Course Completion Rate by Race/Ethnicity



	2012-13	2013-14	2014-15	2015-16	2016-17
African American	29.9%	29.1%	21.9%	33.3%	39.0%
Asian	58.7%	61.8%	62.2%	73.1%	72.9%
Hispanic	21.3%	25.3%	25.7%	31.3%	34.5%
*District (no Charters)	41.6%	44.4%	45.2%	51.4%	55.9%



Students asked...

- ❖ How does this impact our education?
 - Per pupil spending, Instruction per pupil, others
- ❖ Does race have to do with the productivity growth? How? Why?
- ❖ Does race have to do with the educational attainment? How? Why?
- ❖ How does this impact students' pathway for success (responsible and productive citizens)?



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Other Data

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San Jose, California Poverty Rate By Age

What's the Poverty Rate By Age in San Jose, California?

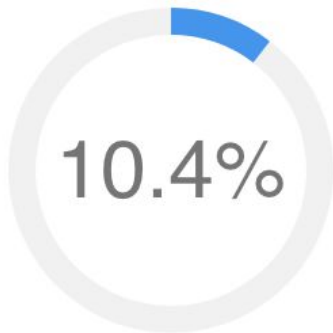
San Jose, California Poverty Rate Distribution by Age

Breakdown of San Jose, California Poverty Rate By Age

Age	Poverty Rate
Children Under 6	12.8% ?
Children 6 to 11 Years Old	12.6% ?
Adolescents 12 to 17 Years Old	13.2% ?
Adults 18 to 59 Years Old	10.3% ?
Adults 60 to 74 Years Old	9.3% ?
75 to 84 Years Old	11.2% ?
Over 85 Years Old	14.9% ?

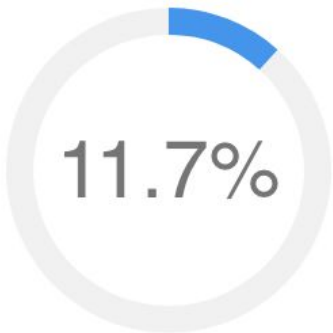
San Jose, California Poverty Rate By Place of Birth

What is the poverty rate for residents of San Jose, California born US Citizens vs Foreign-Born?



US Citizen

The Poverty Rate for residents of San Jose, California who were born citizens of the United States is 10.4%.



Foreign

The Poverty Rate for residents of San Jose, California who were born citizens of a country other than the US is 11.7%.

Poverty Rate for residents of San Jose, California born US Citizens vs Foreign-Born

Foreign-born residents of San Jose, California have a higher poverty rate than those who were born US citizens.

Of the 608,428 residents of San Jose, California who were born citizens of the United States, 63,024 (10.4%) had income levels below the poverty line within the past year.

Conversely, 45,685 (11.7%) of 390,400 residents of San Jose, California who were born citizens of a country other than the US reported income levels below the poverty line within the past year.



Wage by Gender in Common Jobs

The closest comparable data for the census place of San Jose, CA is from the state of California.

\$72,549

AVERAGE MALE SALARY

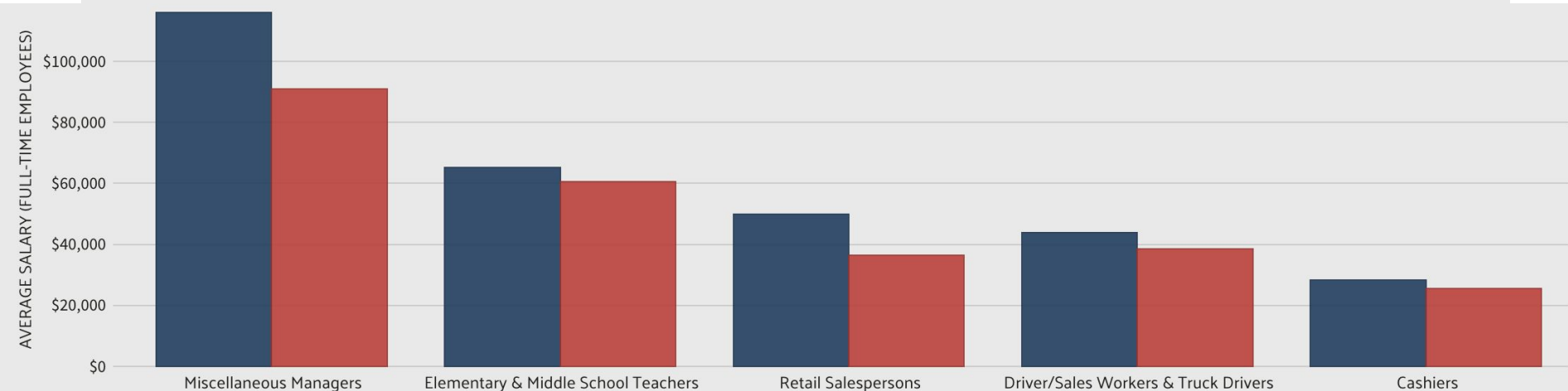
± \$583

\$56,697

AVERAGE FEMALE SALARY

± \$421

In 2016, full-time male employees in California made 1.28 times more than female employees.



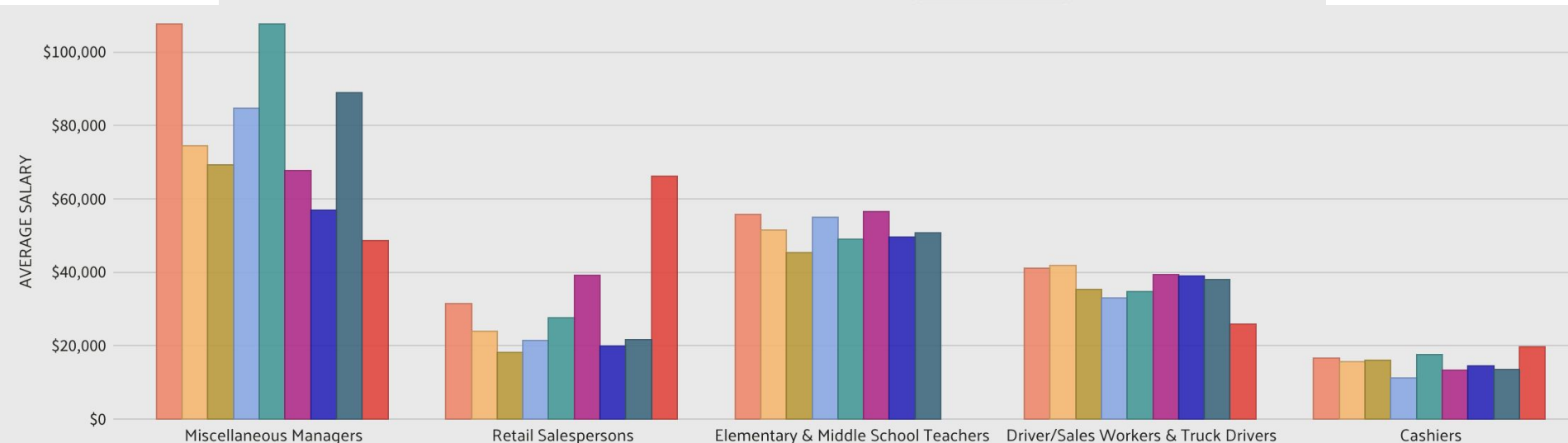
Wage by Race & Ethnicity in Common Jobs

The closest comparable data for the census place of San Jose, CA is from the state of California.

HIGHEST AVERAGE SALARIES BY RACE & ETHNICITY

1. Asian
\$67,288 \pm \$924
2. White
\$60,293 \pm \$479
3. Two or more races
\$50,075 \pm \$1,394

In 2016 the highest paid race/ethnicity of California workers was



Response

- Awareness
- Acknowledgement
- Action
- Advocacy



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	<div> <div>Awareness</div> <div>Acknowledgement</div> <div>Action</div> <div>Advocacy</div> </div>	Tool(s) / Resource(s)
Relevance		
Reality		
Response		
Reflection		



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Belief creates reality.



Do you believe...?

ALL students are capable?

ALL students are competent?

ALL students can do mathematics?

**ALL students are valuable to your classroom
community?**

ALL students bring the best in YOU?

- 32% are capable of mathematics
- 11% are competent in mathematics
- 52% can do mathematics
- 102 teachers are surveyed



Mathematics Identity

(Martin, 2009, Aguirre, Mayfield Ingram and Martin, 2013)

“Mathematics identity refers to the dispositions and deeply held beliefs that individuals develop about their ability to participate and perform effectively in mathematics contexts and to use mathematics in powerful ways across the context of their lives (p.14).”

- Self understanding
- Other's views and ways of positioning
- Negotiation
- Expressed as stories (narrative forms) of lived experiences
- Is one of many identities (academic, faith cultural, family, etc.)



ALL Mathematics Teachers are Identity Workers...

(Gutierrez, 2014)

“ By virtue of mathematics being political, all mathematics teaching is political. All mathematics teachers are identity workers whether they consider themselves as such or not. They contribute to the identities students construct as well as constantly reproduce what mathematics is and how people might relate to it (or not).”



Teaching Mathematics for Social Justice

“Students need to be prepared through their mathematics education to investigate and critique injustice, and to **challenge**, in **words and actions**, oppressive structures and acts – that is, “**to read and write the world**” with mathematics.”

“To **read the world** is to understand the sociopolitical, cultural, historical conditions of one’s life, community, society and world; and to **write the world** is to effect change in it.”

– Eric Gutstein



Teaching Mathematics for Social Justice

“Teachers (not only math teachers) need to conceptualize themselves as “transgressive” - see their role as part of the larger social movements, and explicitly attempt to create conditions for young people to become active participants in changing society.”

Rochelle Gutierrez, 2009
2009



Framework

As educators, we need to be clear on our stance. . . that we are advocates to empower students in naming and claiming their mathematical identity.



Teaching Math for Social Justice

Social Justice Pedagogical Goals

Reading the world with mathematics

Writing the world with mathematics

Developing positive cultural and social identities

Mathematics Pedagogical Goals

Reading the mathematical word

Succeeding academically in the traditional sense

Changing one's orientation to mathematics



Culture of Positive Mathematical Identity



[Mathematics] Success Means...

"It is a lifelong journey to reflect upon situations presented, reactions/decisions made that support my future."

"How much rent are we paying? Why are we paying this much?"

"Should I pay my credit card monthly?"

"Which car should I buy? lease?"

"I know how to budget my expenses."

"I have the skills to be successful in the workplace."

"I can prepare my own tax."

"I can get a HS diploma and use these math for my next math classes."

"I can apply what I'm learning in class to other life's situations."

"I can plan to support my schooling after HS."

"I enjoy number calculation and manipulation!"

"I can interpret my pay scale."

"I see how these concepts relate to life ."



CTE - Five department
- start next year (Gr 10)

Try to find
Scholarships
from sports.
(Football)

SPORTS

Save for
college

Scholarship

Work
and College

- Apply government
scholarships.
- Connect with company
or organization
if they offer
scholarships.

REQUIREMENTS
FOR
GRADUATION
WC/A-G
core
Electives
science
math
ELA
• Community service
• AP classes
3 or better

College and
Career
pathway
save
work
Scholarship

Continue with
work and attend
community college.
Save for 4-year
degree.

Consider the
scholarship pathway
to career.
Take AP classes
and save with
4th 5.

We are Change-Makers

Having studied their roles in their communities and the world at large, students start to conceptualize themselves as change-makers.

By learning from peers and other members of the community, students will begin to make plans as to how they can make the world around them a better place.



Essential Questions

- What are the enduring problems/issues we see in our community? society? world?
- Why do you think these problems/issues exist in our society and in the world?
- What makes people agents of change?
- How do we know the types of change that they are making?
- What inspires people to take action?



Developing Mathematical and Statistical Questions

IMPORTANT

What mathematical question might you ask about the information?

What facts, information, etc. do you need to know to answer the mathematical question?

What facts, information, etc. do you need to know to answer the mathematical question?

What is the first question that comes to mind upon seeing the information?

Wage by Gender in Common Jobs

The closest comparable data for the census place of San Jose, CA is from the state of California.

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AVERAGE MALE SALARY
± \$583

\$56,697

AVERAGE FEMALE SALARY
± \$421

In 2016, full-time male employees in California made 1.28 times more than female employees.

What statistical question might you ask about the information?

What facts, information, etc. do you need to know to answer the statistical question?

How will you gather facts, information, and/or data? What sampling method would you use? Why?

What do you want to measure or find from the data gathered?

How would you know if the result is statistically significant? What measure would you use? Why?

How will you approach the problem to answer the mathematical question? What method(s) would you use to answer it?

Words of Wisdom for Math Teachers

- Build rapport with your students because students are more likely to like and connect with a teacher if they can talk about more things other than the class that they are currently in.
- To be flexible with students and what goes on in their life's. Also, be organized and try to incorporate students into the teaching because that motivates them into learning the concepts.
- Understand and care about the students who care about their work and their grades just as much as those that seem like they don't care because it sometimes only takes one person in kids life to make a difference and turn them around.
- Take some time to get to know your students and don't rush into concepts so that everyone has an equal chance to engage in mathematics
- Be comprehensive with the teaching material but don't spend too much time on one area. Be open to student feedback.
- Connect with your students. Who are you in your students' lives (friend, mentor, guardian, police)?
- Be patient but be strict. It will take some time to adjust to the students and for the students to adjust to a teacher. Have fun with your students while still keeping it educational. The last thing a student wants is to sit in a class for two hours listening to a lesson, make it fun! Whether it's an honors class or not still stress the importance of the lesson and if they are struggling try to explain it in a way they can understand, such as visuals and going step by step. Being a teacher is hard, there is a lot to get done in such little time. Keep your students on track and check up on them. Make sure they are all on board and up to date. Good luck!



“In this math class, I learned that there are more things beside numbers. I learned to think of fairness, injustices, and inequity every time I see distorted data. I learned to further read and seek other information before I make a statement. Now, my mind is open to more things that affect my life, and my family. I am more aware and independent and learned to be strong to voice my opinion.”

- Rebecca, Grade 9, May 2016



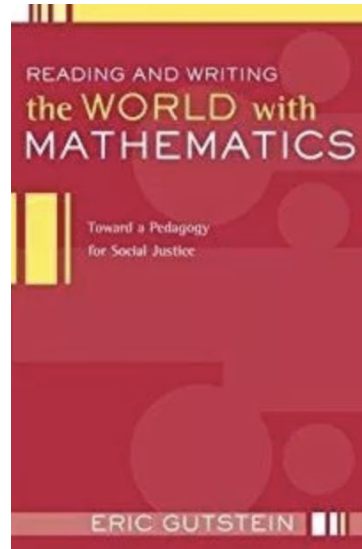
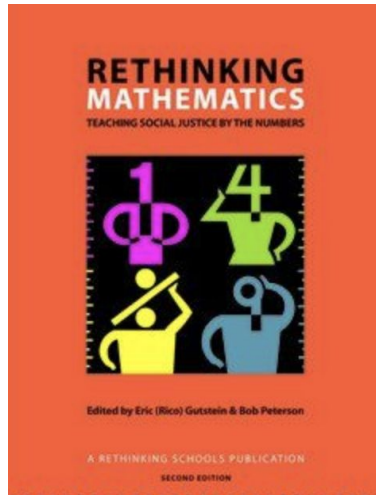
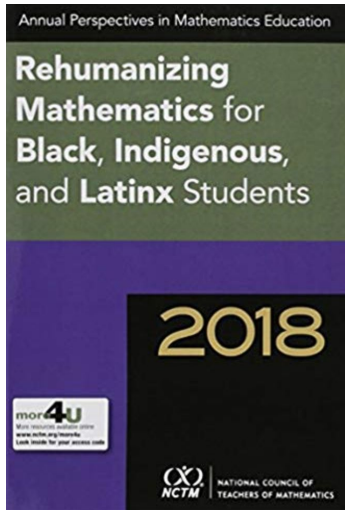
Mathematics for Social Justice

“Uses the power of mathematics both in supporting, and empowering students to understand the communities in which they live and in gaining a better sense of how inequalities are produced and contested in this world.”



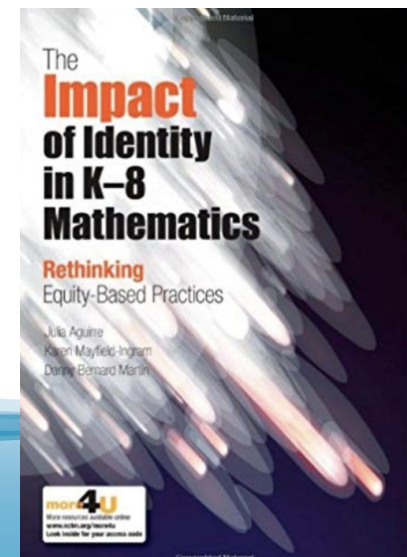
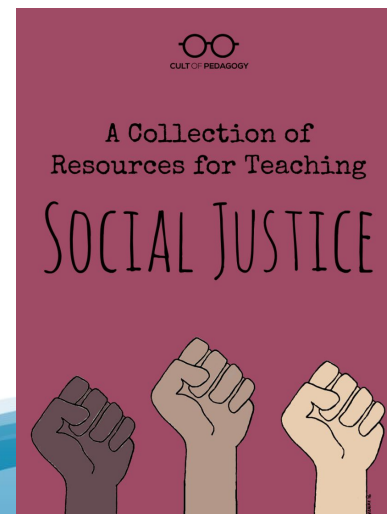
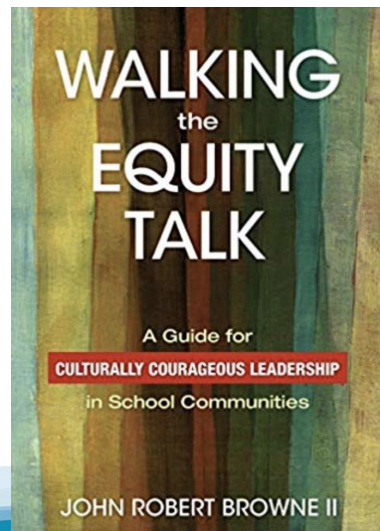
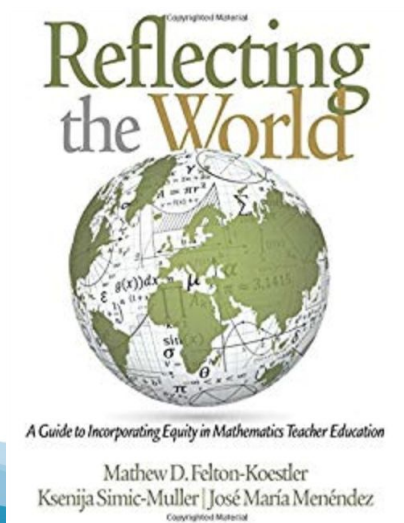
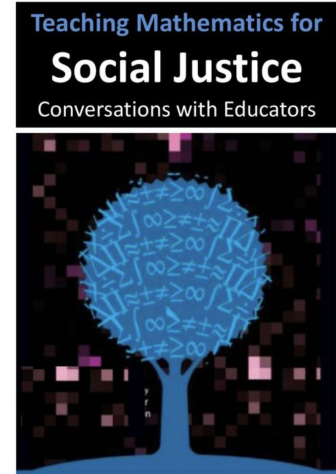


Inspired by...



Reflection Questions

- How might teachers begin to teach mathematics for social justice? How might teacher educators begin to teach teachers how to teach mathematics for social justice?
- How might teaching mathematics for social justice "look like?"
- How can mathematics be re-envisioned as a means to create a more socially just world?



Thank you!

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