

# Statistics For Social Justice

## Contacts

<b>1. District Information</b>	Coachella Valley Unified
<b>2. Course Contact</b>	

## A. Cover Page

<b>1. Course Title</b>	Statistics for Social Justice
<b>2. Transcript Title</b>	
<b>3. Transcript Course Code</b>	
<b>4. Seeking Honors Distinction? (HS Only)</b>	No
<b>5. Subject Area</b>	Section C - Math (Year 4)
<b>6. Grade Levels</b>	12th Grade
<b>7. Unit value</b>	1.0 (one year, 2 semesters, or 3 trimesters equiv)
<b>8. Was this course previously approved by UC? (HS Only)</b>	No
<b>9. Is this course, or any section of this course, taught in an online learning environment?</b>	No
<b>10. Is this course classified as a Career Technical Education course: (HS Only)</b>	No

## 11. Brief Course Description

The purpose of this course is to expose students to social issues through a mathematical lens. They will be able to apply the statistical skills that they learn to analyze society and determine where they stand as an individual and community. The course will not only look at the injustices but also have the opportunity to explore the limitations that mathematics presents and complexities of certain histories. Finally, students will begin to reimagine their future and take actions that move towards social change.

**12. Pre-requisites:** Integrated Math 3

**13. Co-Requisites:** None

## 14. Context for Course

Ethnic Studies is a college preparatory elective that will help students fulfill the A-G requirements for a

preparation and admission to a UC/CSU four-year university. Ethnic Studies will be made available to 9th-12th grade students.

### **15. History of Course Development**

Collaboration for the creation of this course has occurred over many days at the district level with history teachers and with district administration support. Participants in the courses, collaborated with other school districts across California to help support the construction of this course. This course is created using the common core standards.

### **16. Textbooks**

Statistics CPM Educational Program

### **17. Supplemental Instruction Materials**

**Videos:** Wealth Inequality in America

**Studies:** An Analysis of the New York City Police Department’s “Stop-and-Frisk” Policy in the Context of Claims of Racial Bias

## **Course Content**

### **Course Purpose**

The purpose of the course Statistics for Social Justice is to expose students to social issues through a mathematical lens. Students will be empowered to actively engage in the exploration of real data, use it to plan and conduct studies, and to anticipate patterns in the social context. Students will describe and interpret authentic data patterns, and deviation from those patterns using graphical and numerical representations of their social context. They will collect data according to well-developed plans if valid information on a conjecture is to be obtained. These plans will include clarifying the question and deciding upon a method of data collection and analysis. Students will be exposed to probability and simulation techniques to explore random phenomena and anticipate data distribution under a given model. Students will also learn how to estimate population parameters and testing hypotheses using appropriate tools. They will use all the statistical analysis learned in the course to analyze society and become critical about the injustices that certain individuals or groups face in their everyday. Mathematics will be a powerful tool, which allows them to visualize and examine these injustices, but they will also explore the complexities of histories that are erased when data is simplified into numbers. The goal of the course is to encourage students to reimagine their future and take actions that move towards social change.

### **Course Outline**

#### **Introduction Unit: Theoretical Frameworks of Race, Class, Gender, and Ethnic Studies**

Theme: Constructing Criticality of One’s Experience through Theoretical Frameworks of Race, Class, Gender, and Ethnic Studies

The introduction unit in this course introduces students to foundational concepts and frameworks of Ethnic Studies, Race, Ethnicity, and Gender, and how these concepts and frameworks will be used to assess and

analyze historical and current events found in literature. Students will learn to apply a sociological lens in researching and discussing issues, which include race and racism, classism, gender and sexism, colonization, oppression, and resistance. Students will develop skills in decoding meanings produced by experiences based on race, ethnicity, and gender in social contexts, as well as the construction of race, ethnicity, and gender identity through everyday life.

Essential Question:

How does American society perceive Race, Class, and Gender?

Objectives:

1. To learn the theoretical foundations and the lens' of Ethnic Studies and Critical Theory
2. To be introduced to the different sociological perspectives and to become familiar with the factors that determine a dominant and a subordinate group in relation to power and privilege between dominant/subordinate groups (i.e. Hegemony).
3. To understand how race and gender is socially constructed through Critical Race

Theory and Critical Gender Theory

Assignment:

Students will write a one-page essay synthesizing the theoretical foundations and lens of Ethnic Studies, Critical Theory, Critical Race Theory, and/or Critical Gender Theory. They will reflect on how these concepts and frameworks impact historical and current events. Lastly, they will assess how the use of the critical lenses will shape their educational journey.

**Unit 1: Data Representation and the Census**

Overview:

Students will begin exploring and understanding data through the study of descriptive statistics. Students will learn to collect, properly display, analyze, and describe data. Visualizing information in the form of graphical representations such as: dot plots, scatterplots, stem-and-leaf plots, histograms, bar graphs, circle graphs, and two-way tables. They will discover the different types of data and variables. They will examine the mean and median of each data and connect it to the IQR and standard deviation to decide which is most appropriate considering the shape and outliers of the distribution. They will calculate z-score, use percentiles and find linear correlations between data.

Students will connect all the statistical analysis that they learned to social issues about Race, Ethnicity, and Gender that arise from the census. They will also learn to complete and use the census as a form to gather information about the population in our classroom to analyze and visualize the data. In addition, they will examine and discuss the implications for society to categorize individuals in these ways. They will look at the development of the census to show the complexity of their history. They will then develop an understanding of how the census is a form of data representation, but simplifies our societal context. The fluidity of the census over the years shows that the categories of race and ethnicity are social constructs, which drives many aspects of our lives.

Essential Question:

How can data representation be used to describe and analyze patterns?

## Objectives:

Students will:

1. represent data in different forms.
2. display data using the central tendency and 5 point summary.
3. find the IQR and standard deviation.
4. learn to calculate z-score, use percentiles and find linear correlations between data.

## Assignments:

**Census Data Comparisons-** Complete the census to gather data about the class. You will focus on three related set to compare the data in the form of box plots or histograms, central tendency, 5 point summary, IQR, standard deviation, z-score, and linear correlations. Make a full analysis in terms of tendency, variation, shape and extremes. Finally, discuss how your project's conclusion can be useful in analyzing the evolution of different census questionnaire and how it relates to the construction of race and ethnicity in the U.S.

## Unit 2: Two Variable Quantitative Data and Women

### Overview:

Students will explore relationships between variables through the use of scatterplots, association, and correlation. They will learn to describe associations between two quantitative variables from a scatterplots. They will find the line of best fit and interpret the slope and  $y$ -intercept of the model in each context. Students will also explore the limitations of their models and use residuals to create the least squares regression line. They will apply the regression line to predict  $y$  for a given  $x$  and recognize the implications of extrapolation. Students will learn to describe the association between two quantitative variables—the form, direction, strength, and outliers. They will calculate and graph residuals, find the correlation coefficient, coefficient of determination, and interpret these quantities in the context of the situation. Students will understand why association is not the same as causation.

Students will connect what they learned about examining two variable relationships to issues that affect women in our society. To this day there continues to be a double standard in regards to women in many aspects of their lives. Although there have been advances towards gender equality, society has different expectations for men and women. Students will develop an understanding about the struggles women are faced with by analyzing data about women in education, workforce, economy, and their role at home. It is important to analyze the history about women and the influence society has on the actions they take.

### Essential Question:

How can you describe the relationship between two variables and use it to make predictions?

## Objectives:

Students will:

1. Make scatterplots to display the relationship between two quantitative variables.
2. Recognize positive or negative associations in linear patterns.
3. Explain the slope and  $y$ -intercept of a regression line.
4. Recognize outliers and unusual patterns.

Assignments:

**Hiring Practices Project** – Students will gather data of certain hiring practices that represent qualified male and female workers to be hired. Then use their understanding about associations and correlations to determine if there were prejudicial hiring practices between men and women.

**Unit 3: Multivariable Categorical Data and Health**

Overview:

Students will explore probability in the context of multivariable categorical data. They will extend what they learned about statistical association and use it to represent two-way frequency tables – Association and conditional. Students will learn to calculate the probability of different situations, using the correct notation, to analyze specific outcomes. Although systems can be highly accurate in detecting rare events, students need to be able to analyze false positives. They will decide whether social cost of false positives is greater than the benefits of true positive results. Students will use probability tree diagrams as a tool for solving and conceptualizing situations involving more than two categorical variables and make comparisons between them. Students will then learn how to problem solve with categorical data and use simulation probabilities.

Students will connect what they learned about probability to issues about Health. They will look at systems about HIV testing and other drug tests to analyze false positives. Students will measure the risks of developing diabetes, high blood pressure, high levels of cholesterol, and depression. They will use this information to make different choices about finding other forms of maintaining a healthier lifestyle.

Essential Question:

How are the advantages and disadvantages of categorizing multivariable data?

Objectives:

Students will:

1. Represent two-way frequency tables.
2. Calculate the probability of different outcomes.
3. Analyze false positives.
4. Utilize probability tree diagrams to make comparisons.

Assignments:

The April 10th issue of the Journal of the American Medical Association reports a study on the effects of anti-depressants. The study involved 340 subjects who were being treated for major depression. The subjects were randomly assigned to receive one of three treatments: St. John’s Wort (an herb), Zoloft (Pfizer’s) or placebo for an 8-week period. The following are the mean scores (approximately) for the three groups of subjects over eight - week experiment. The first column is the baseline. Lower the scores means less depression.

Placebo	22.5	19.1	17.9	17.1	16.2	15.1	12.1	12.3
Wort	23.0	20.2	18.2	19.0	16.5	16.1	14.2	13.0
Zoloft	22.4	19.2	16.6	15.5	14.2	13.1	11.8	10.5

- a. Create a graph to display these means.
- b. Calculate the probability of receiving the placebo?
- c. Analyze the false positives that can arise from taking any of the anti-depressants?

#### **Unit 4: Studies and Experiments and Racial Profiling**

##### Overview:

Students will explore different survey designs and consider the bias of how the data was gathered. Students will discover the importance of random selection in sampling to produce a sample that is representative of the population. They will apply different methods of sampling and consider the strengths and weakness of each. They will compare and contrast observational studies and experiments to analyze the conclusions for various studies. Students will determine what makes a well-designed experiment. They will discover what is necessary to produce treatment groups that have similar attributes and explore other features of experimental designs.

Students will apply the idea about studies and experiments to issues about racial profiling. They will analyze different data and break it down according to race. Students will be exposed to studies about the “stop and frisk” policy, the likelihood of someone going to prison, and different court sentencing for similar crimes. Based on this analysis students will examine our criminal justice system and its implications to our society.

##### Essential Question:

How do we analyze surveys, studies, and experiments to judge the validity of the conclusion?

##### Objectives:

Students will:

1. Recognize bias from inferior sampling methods.
2. Select a simple random sample (SRS) from a population.
3. Determine whether a study is observational study or experiment.
4. Recognize bias due to confounding of explanatory variables and with lurking variables with either an observational study or experiment.

##### Assignments:

1. Students will conduct an experiment to find the probability of randomly choosing 100 different colored marbles.
2. They will then look up the demographics of the New York City that is represented by the data they gather by race.
3. Then they will analyze a case study about an analysis of the “Stop and Frisk” policy in the claims of racial bias.
4. Finally, they will determine the validity of the case study and make conclusion about their hypothesis.

#### **Unit 5: “Normal” Distribution and the Wealth in the US**

##### Overview:

Students will explore different types of density functions and create a bell-shaped mathematical model of data called normal probability density function. Students will examine similarities and differences between a relative frequency histogram as a way to represent a sample, and the normal distribution model for the population

represented. Students will learn that every normal density function has an inverse. They will use the inverse normal functions to convert probabilities and percentiles into values of a random variable, and then discuss the standard normal distribution and z-scores.

Students will connect what they learned about density functions and normal distributions to different issues in society. The wealth disparity in the U.S. is unimaginable and only keeps getting worse because of capitalism, laws and regulations that benefit the rich, and the lack of realistic opportunities for social mobility. Students will be exposed to different forms of oppression that they are faced with which maintain this structural inequality. They will experience the power of visualizing data of these disparities and use it to analyze the reality of everyday life in our society.

Essential Question:

How do I use density functions and normal distributions to analyze data?

Objectives:

Students will:

1. Classify different types of density functions.
2. Create bell-shaped mathematical models.
3. Apply inverse normal functions to convert probabilities and percentiles into values of a random variable.
4. Learn the standard normal distribution and z-scores.

Assignments:

A test correctly identifies a disease in 95% of people who have it. It correctly identifies no disease in 94% of people who do not have it. In the population, 3% of the people have the disease. What is the probability that you have the disease if you tested positive?

**Unit 6: Discrete Probability Distribution and Education**

Overview:

Students will explore binomial and geometric distributions. They will learn to calculate the mean and variance of a discrete random variable, and linear combinations of independent random variables. Students will learn the variability of  $X - X$  and what it represents. They will develop notions of shape, center, and spread of binomial distributions and use a normal approximation to the binomial distribution to compute probabilities. Students will do the following for both binomial and geometric distributions: use technology or formulas to determine probabilities and construct probability distribution tables and histograms, calculate cumulative distribution functions, and formulate expected values and standard deviation.

Students will connect the ideas about probability distribution to issues around our education system. They will evaluate data about the issues surrounding educational attainment in relation to mathematics. It has become increasingly critical to provide students with accessibility to higher levels of mathematics because it has become an issue of their civil rights. In addition, students will examine data about policies that reinforce the school to prison pipeline. Students will assess educational policies and beliefs to reimagine a system that will be more egalitarian.

Essential Question:

How can you compare probability distributions for discrete and random variables?

## Objectives:

Students will:

1. calculate the mean, variance, and variability of  $X - X$ .
2. use technology or formulas to determine probabilities and construct probability distribution tables and histograms.
3. calculate cumulative distribution functions.
4. formulate expected values and standard deviation.
5. use a normal approximation to the binomial distribution to compute probabilities.

## Assignments:

A company produces cases for a phone that is 5.8 inches tall. The case is designed to have a snug fit. The engineers designed the height of the case to be normally distributed with a mean of 5.85 inches and a standard deviation of 0.017 inches. Let  $X$  be a random variable representing the height of a randomly chosen case.

1. Is  $X$  continuous or discrete? Explain.
2. Find  $P(X < 5.8)$ .
3. In a shipment of 1000 phones, let  $Y$  represent the number of cases that are smaller than 5.8 inches in height. Is  $Y$  continuous or discrete? Explain.
4. In the shipment of 1000 phones, find the probability that  $Y = 2$ . Assume that the heights are all independent.

## **Unit 7: Data Sampling and Stereotypes**

### Overview:

Students will explore a statistical analysis technique used to select, manipulate, and analyze a representative subset of points to identify patterns. They will develop an idea of sampling distributions, confidence intervals, and compare proportions within the samples. Students will use simulation to estimate a sampling distribution of a sample proportion, and recognize that this creates a reasonable estimate of the variability of the true sampling distribution. The binomial distribution is revisited to derive the formulas and conditions for the normal approximation for the sampling distribution for a sample proportion; this is the root of proportion confidence intervals and tests.

Students will apply the idea about data sampling to common stereotypical ideologies about certain ethnic groups. Students will use data to compare different groups to each other, while looking at the complexities between certain samples. Students will be critical about stereotypes that exist which seem to be good. For example, the “Model Minority” is an idea that can be used against other ethnic groups. This issue around immigration and the comparison of Asians to Latinos is unreasonable because it ignores circumstances that contribute to educational attainment. Statistics can create false comparisons of data to compare groups, because it oversimplifies and erases the history of other contributing factors. Data can be manipulated to show strong correlations that develop certain stereotypes about certain groups and students need to be conscious and critical about this.

### Essential Question:

What is important to consider about selecting a sample so that it isn't biased?



## Objectives:

Students will:

1. Identify parameters and statistics in a sample or experiment.
2. Develop an understanding about sampling distributions and confidence intervals.
3. Compare proportions within samples.
4. Recognize when a problem involves a sample proportion.

## Assignments:

You have been hired by the National Election Commission to examine how the American people feel about the fairness of the voting procedures in the U.S. Who will you ask?

Barack Obama received 51% of all votes in the U.S. Presidential election of 2012. One county in Indiana likes to brag that it voted “exactly like the country”—which implies a claim that their proportion of votes for Obama should also have been 51%. Kiran is interested in testing this claim.

1. Write the county’s claim in symbols and define them.
2. Explain why the appropriate hypotheses for this test are  $H_0: p = 0.51$  and  $H_A: p \neq 0.51$ .
3. Kiran performed a random sample of voters from the county and found that 308 of the 652 sampled voted for President Obama. The county has around 12,000 residents. Check that all the conditions for the normal approximation to the sampling distribution are met, assuming the null hypothesis is true.
4. What evidence does Kiran have for the alternative hypothesis (use symbols)?
5. Calculate the standard deviation of the sampling distribution assuming the null hypothesis is true. Then calculate the test statistic (z-score of the sample). Sketch the standard normal curve and shade the entire region that represents statistics as or more extreme than the one calculated, based on the new alternative hypothesis. (Hint: remember this is called a two-tailed test.)
6. Use a calculator to calculate the area of the shaded region (the  $p$ -value). You can use the symmetry of the situation to help.
7. Conclude: at  $\alpha = 0.05$ , does Kiran have sufficient evidence to reject the county’s claim?

## **Unit 8: Chi-Squared and Social Justice**

### Overview:

Students explore the chi-squared inference procedures because it is a method that compares two or more groups. Students realize that it is better to have a single procedure that summarizes the difference across multiple samples to compare them. They learn the chi-squared goodness of fit test and have an opportunity to practice applying the procedure in multiple contexts. Students extend their use of chi-squared procedures to tests of independence and see if there is an association between the variables. The same procedure will be applied to a setting where multiple samples have been gathered, and the question of homogeneity of proportions is considered.

Students will connect the chi-squared inference procedures to any issue in relation to social justice. They will be able to analyze different aspects about society through the lens of race, class, and gender to their life. They will apply the mathematical skills that they have acquired throughout the course to an issue that they are passionate about. More specifically they will gather data, apply different statistical analysis to contemplate and envision how mathematics can serve as a tool to be used for social justice.

### Essential Question:

How do we use the chi-squared distribution to construct a confidence interval and how are they used in

statistics?

Objectives:

Students will:

1. Calculate goodness of fit test.
2. Distinguish between tests of homogeneity and populations and tests of association.
3. Perform chi-squared test.
4. Interpret chi-squared test.

Assignments:

Zach is doing an experiment on whether or not playing different modes of a video game can raise your blood pressure. He randomly assigns 120 students from his school to two treatments. 60 students will play Call of Battle: Limit to Infinite in the online mode, while the other 60 will play offline. He then measures their blood pressure after 20 minutes of playing. Zach found that 42 of the online players raised their systolic figure to over 131, while 34 of the offline players had a systolic figure over 131.

A test of significance ( $\alpha = 0.05$ ) was conducted on the following hypotheses: the percent of high blood pressure players is the same for both treatments ( $H_0$ ), and a larger percentage of people playing the game online will have high blood pressure ( $H_A$ ).

This test resulted in a  $p$ -value of 0.0648.

1. Interpret the results of the test. Specifically, interpret the  $p$ -value and what conclusions can be drawn from this experiment.
2. Based on your explanation from part (a), what type of error (Type I or Type II) could have been made? Clearly explain this error in the context of the problem.

***Key Assignments:***

**Unit 1: Data Representation and the Census**

Assignments:

**Census Data Comparisons-** Complete the census to gather data about the class. You will focus on three related set to compare the data in the form of box plots or histograms, central tendency, 5 point summary, IQR, standard deviation, z-score, and linear correlations. Make a full analysis in terms of tendency, variation, shape and extremes. Finally, discuss how your project's conclusion can be useful in analysing the evolution of different census questionnaire and how it relates to the construction of race and ethnicity in the U.S.

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Assignments:

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- Create a graph to display these means.
- Calculate the probability of receiving the placebo?
- Analyze the false positives that can arise from taking any of the anti-depressants?

### **Unit 4: Studies and Experiments and Racial Profiling**

#### **Assignments:**

- Students will conduct an experiment to find the probability of randomly choosing 100 different colored marbles.
- They will then look up the demographics of the New York City that is represented by the data they gather by race.
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In the shipment of 1000 phones, find the probability that  $Y = 2$ . Assume that the heights are all independent.

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5. Calculate the standard deviation of the sampling distribution assuming the null hypothesis is true. Then calculate the test statistic (z-score of the sample). Sketch the standard normal curve and shade the entire region that represents statistics as or more extreme than the one calculated, based on the new alternative hypothesis. (Hint: remember this is called a two-tailed test.)
6. Use a calculator to calculate the area of the shaded region (the  $p$ -value). You can use the symmetry of the situation to help.
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have high blood pressure (HA).

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2. Based on your explanation from part (a), what type of error (Type I or Type II) could have been made? Clearly explain this error in the context of the problem.

### **Instruction Methods and/or Strategies**

The class will include a variety of instructional methods designed to help promote student learning, achievement, and engagement. We will use direct instruction, discovery, collaborative group work, independent work, and problem based learning. Each of the different types of methods will be targeted to areas we feel they will be most effective.

Students will work in a number of settings, individually, in pairs, in triads, in small groups, and in whole group. Each will be structured to provide a positive learning environment.

#### Group work and peer tutoring:

Collaborative group work will be used throughout the course. Collaborative group work is instruction where students work together to explore different topics and ideas found . During collaboration, the teacher will give the students a problem or situation they are to work on together. The teacher will then go from group to group offering assistance in the form of clarifying instructions and asking leading questions or posing thought-provoking ideas. The teacher is not offering answers or solutions to students, but rather encouraging the group to use each other as their resources and sounding boards. Collaborative group work will be used usually after a topic has been introduced and the students have some comfort with it. It will also be used to help struggling students get up to speed by giving them another entry point to the material (besides the teacher). This group work furthers the goal of teaching the students problem solving by not allowing them to rely on the teacher for answers or solutions.

Students will be assigned a job that will alternate within each group activity so that they are exposed to all positions. Students will be assigned to be a Clarifier, a Questioner, a Summarizer, or a Planner. A Clarifier will need to look at words and phrases that the group may not understand. They will need to find all the essential words and use resources such as other group members, their textbook, thinking maps, and vocabulary on walls. A Questionnaire will ask questions to the group such as “What do we need to find out? What information do we need from this problem? Is there any information we do not need?” A Summarizer will summarize the purpose of the problem and how they inferred the purpose. The Planner will explain what steps will need to be followed and will use words such as first, next, then, in addition, and etc.

#### Individual discussion to quickly assess individual learning:

As a large portion of class time will be spent in collaborative activities, it is important for students to also be able to work independently. Either during the discovery or practice portion of the day students will be required to analyze the reading(s) on their own. The premise is that students become so dependent on other members of the class for the analysis of reading(s), that it robs them of the opportunity to develop their own critical thinking. During independent time the teacher will walk around the room observing and assisting each student as they work on the reading(s). Some may need more assistance than others and this is the appropriate time for

this to occur.

#### Project-based Learning:

Project-based learning will be used to help students understand how the Ethnic Studies theoretical framework can be used to model, understand and solve real world situations. Project-based learning focuses on students learning about a topic through the experience of problem solving. This learning method will be used after a topic has been introduced and students have had a little time to work with it. Project-based learning is also another entry point for students to practice their problem solving skills. It gives them the opportunity to approach a situation, analyze it, and then apply their prior learning from English, Social Studies and other areas of study and life. Further, it allows them to contextualize Ethnic Studies within their everyday life. The teachers will be required to provide a relevant problem to solve, connect it to the material being learned, and provide clear instructions.

#### Direct instruction:

Direct instruction is used to introduce new information or a new topic, and to set the stage for discussion. Teachers also model effective ways to understand and analyze the course material utilizing a variety of instructional methods (i.e close reading, critical reading strategies, etc.)

#### Think Pair Share:

In many instances a mixture of explicit and implicit teaching are employed. For example, a teacher poses a question based on the literature, film, or historical document, students are then instructed to think about it, write something down, and then share out with a partner before whole group discussions. Students are given the opportunity to add on or question a response to deepen the class discussion.

#### Communication:

Communication both orally and in writing to help students internalize the concepts learned in the literature, academic research, and historical documents learned in the course by using academic language. This is especially crucial for English language learners. The process of writing an explanation requires students to think deeply about concepts in order to be able to describe it in words.

Students will also have to explain their findings and conclusions in writing. Students will practice writing to demonstrate their academic understanding of the concepts and ideas learned in the course. They will describe not only their findings and conclusions gained from the readings, but also synthesize their application to real-world scenarios. The writing not only helps the student clarify their thinking, but it also helps the teacher assess student understanding and where gaps are present in student thinking.

#### English Learner Strategies:

To help second language students, teachers employ Quality Teaching for English Learners (QTEL) strategies to build understanding of problem situations while lifting the academic language. Although these strategies are specified for English Learners, they benefit all students. Strategies such as round-robin to ensure equal voice, jigsaws to allow for differentiation, collaborative posters to extend the learning, and double-entry journals are some examples. Although other strategies may be employed as needed such as:

- Visual and graphic descriptions of problems
- Thinking Maps
- Explicit and repeated instruction
- Socratic discovery
- Hands-on projects and experiential learning
- Interactive online lessons and projects using the iPad

#### Real Life Problems:

Students will be given real life problems that require students to use multiple disciplines and research methods to solve or find a solution. Students are given the opportunity to explore relationships, make conjectures, test the conjectures, explore real-life data, and make connections. Students make connections between and among representations, (e.g., between quantitative and qualitative data). They make sense of problems together and interpret answers. Stamina in problem solving is built through increasing complexity of the tasks.

### **Assessments Including Methods and/or Tools**

1. Formative Assessment: Essays will be completed after every unit to assess student understanding of the material learned and where gaps are present in student thinking.
2. Performance Assessment: students will work in groups to create a project based assignment where they will be asked to analyze, problem solve, experiment, make decisions, predict, cooperate with others, present orally and technologically, and produce a product that addresses real-life community issue.
3. Observational Assessment (every day, several times a day): students are asked to participate, read and analyze literature/historical documents/academic research, discuss reading, and explain their learned knowledge to the class.
4. Project-based Assessments: Students are asked to work together to connect the units learned into a cohesive whole. These projects are usually based upon practical situations and require interpretations so students might better grasp how the pieces fit into the larger whole.
5. Traditional Assessments: Students will be given regular intra-unit quizzes and end of unit exams (multiple choice and written). A longer final will culminate at the end of each semester to gauge students' long-term understanding (multiple choice and written).
6. Group assessments: Students will analyze, problem solve, experiment, make decisions, cooperate with others, present orally and/or produce a product (sometimes a written report) throughout each unit.