

Santa Rosa City Schools Course Proposal:

Statistical Reasoning in Sports

Proposal Submitted By: Dr. Rani Goyal; Director, Teaching and Learning

Needs Statement: Discuss how this course fits into your Site and/or the District's goals. Attach minutes of meetings where this course was approved at site or district leadership meetings.

This course serves as an option for students to meet the graduation requirement of three years of math. This course also meets the Theory of Action and Mission and Vision in that the course content address issues of equity and relevancy.

Graduation Requirements: Specify which requirement is met. (High School only)

Mathematics

UC a-g Requirements: Specify which requirement is met. (High School only)

Mathematics C

Explain the rationale for course addition or modification. How does this fit in with district/site goals. Is this course replacing a current course, which course is it replacing and why? Will this course require new sections? Be explicit.

This is an additional course option for the third year of math.

Explain the measurable learning outcomes

In each unit students will use a four-step process (formulate questions, collect data, analyzing data, and make conclusions) to learn a key statistical concept in the context of sports. Each unit will start with a question and students will work through the four components throughout the unit while learning key statistical concepts. For each unit the question posed will be considered along with other supporting questions, analysis will take place with new learning targets for each unit, and will culminate with a unit exam and / or investigative task.

This course introduces students to statistical process in the context of sports: ask questions, collect data, analyze data, and make conclusions. Each unit begins with a sports-related statistical question and then students will use this process to draw reasonable conclusions. Although the

context is sports related, the primary focus of the class is to learn basic principles of statistical reasoning. Major statistical topics include: analyzing distributions, using graphs and summary statistics, correlation and least squares regression, using simulations to estimate probability distributions, theoretical probability distributions including the binomial and normal distributions; rules of probability including conditional probability and expected value, hypothesis testing, Type I and Type II errors, using confidence intervals to estimate parameters and proper methods of data collection. Use of technology will be common throughout the course. Students will have daily assignments, unit quizzes and tests, and investigative projects.

Course Description (To be used in the course catalog)

This course introduces students to statistical process in the context of sports: ask questions, collect data, analyze data, and make conclusions. Each unit begins with a sports-related statistical question and then students will use this process to draw reasonable conclusions. Although the context is sports related, the primary focus of the class is to learn basic principles of statistical reasoning.

Detailed Course Design

(Course design should include the objectives, activities, assessments, and standards to be addressed in this course.)

Unit 1: Testing Claims in Sports

Guiding Question: Is Steph Curry a Streaky Shooter?

Students should learn to:

- Distinguish between performance and ability in sports and make the correlation between performance (statistic) and ability (parameter) as it pertains outside of sports.
- Explain what it means for athletic performances to be independent.
- Use a simulation to investigate the distribution of the number of streaks.
- Use the results of a simulation to determine if there is convincing evidence that an athlete is streaky.

Unit Assignment: Testing Claims in Sports - Investigative Project

Students will research an athlete (or team) and choose a variable that could result in streakiness, such as outcome of game (win/loss) or outcome of shot (made/missed). Students will then write a report to include the following:

1. An introduction that states the question of interest and briefly describes the context of the athlete or team's performance.
2. List the outcomes for the athlete or team.
3. Describe how to use a spinner to simulate the number of streaks the athlete or team is likely to have, assuming the outcomes of their attempts are independent. Then conduct at least 10,000 trials of your simulation using an applet. Include a screenshot with the results of the simulation.
4. Use the results of the simulation to discuss if the athlete or team's number of streaks was likely or unlikely to happen by random chance alone. Then explain if there is convincing evidence that the athlete or team is streaky.
5. Cite the source from which you obtained your data.

Students should learn to how to conduct an investigative project relating to the concept of streakiness, where to locate reliable data and how to perform a simulation using an applet.

Unit 2: Analyzing Categorical Variables

Guiding Question: Did Cam Newton Choke in the Super Bowl?

Students should learn to:

- Identify individuals and variables in a data set.
- Distinguish categorical and quantitative variables.
- Graph the distribution of a categorical variable using bar charts, pie charts, and segmented bar charts.
- Identify what makes some graphs deceptive.
- State the null hypothesis and the alternative hypothesis for a test about change in ability.
- Describe evidence for the alternative hypothesis and provide two explanations for the evidence
- Use a spinner to simulate the distribution of the number (or proportion) of successful attempts.
- Use the results of a simulation to determine if there is convincing evidence of a change in ability.
- Use technology to generate a distribution of simulated performances.
- Use the law of large numbers to explain the effect of sample size.
- Test a claim about ability using the State-Simulate-Conclude process.

Unit Assignment: Analyzing Categorical Variables - Investigative Project

Students will research an athlete (or team) and choose a categorical variable that they can use to measure the athlete's performance in the regular season and in the postseason. Students will then write a report to include the following:

1. Write an introduction that states the questions of interest and briefly describe the context of the athlete's performances. Include the null and alternative hypotheses you are testing.
2. State the number of successes and failures in the regular season and display these data with a graph. Use the percentage of successes in the regular season as the athlete's assumed ability.
3. State the number of successes and failures in the postseason and display these data with a graph. Explain how these data provide evidence for the alternative hypothesis and provide the two explanations for this evidence.
4. Describe how to simulate the athlete's performance in the playoffs using a spinner. Then conduct at least 10,000 trials of your simulation using an applet. Include a screenshot with the results of the simulation.
5. Use the results of the simulation to discuss if the athlete or team's performance in the postseason was likely or unlikely to happen by random chance alone. Then explain whether or not there is convincing evidence for the alternative hypothesis.
6. To whom or what does your conclusion apply? Discuss any limitations to your conclusion. If there is convincing evidence of a change in ability, discuss possible causes.
7. Cite the source from which you obtained your data.

Students should learn the learning targets presented in the unit summary along with how to find reliable data on the Internet, how to analyze this data, and how to make a logical conclusion about their findings.

Unit 3: Comparing Two Percentages

Guiding Question: Do NFL Teams Have a Home-Field Advantage?

Students should learn to:

- Distinguish explanatory and response variables.
- Summarize the association between two categorical variables in a two-way table.
- Construct a segmented bar chart to display association between categorical variables.
- Describe the association between two categorical variables.
- State hypotheses for testing a difference in percentages.
- Describe evidence for the alternative hypothesis and provide two explanations for the evidence.
- Explain how to simulate the distribution of difference in percentages using note cards.
- Estimate a p -value using the results of a simulation.
- Determine if there is convincing evidence for the alternative hypothesis using a p -value.
- Estimate a p -value using technology.
- Test a claim about a difference in ability using the State-Simulate-Conclude process.

Unit Assignment: Comparing Two Percentages - Investigative Project

Students will research an athlete (or team) and choose a categorical variable that they can use to measure the athlete's performance in two different contexts, such as home and away. Students can find relevant data at websites such as www.sports-reference.com which break down a team's or athlete's performance into different contexts. Students will then write a report to include the following:

1. Write an introduction that states the questions of interest and briefly describe the context of the athlete's performances. Include the null and alternative hypotheses you are testing.
2. Display the data in a two-way table and make appropriate graphs to compare the athlete or team's performance in the two contexts.
3. Calculate the difference in the percentage of success in each context and explain how this difference is evidence for the alternative hypothesis. Provide the two explanations for this evidence.
4. Describe how to use note cards to simulate the distribution of the difference of percentages, assuming the null hypothesis is true. Then conduct at least 10,000 trials of your simulation using the applet. Include a screenshot with the results of the simulation.
5. Use the results of the simulation to estimate the p -value. Then make a conclusion by explaining whether or not there is convincing evidence for the alternative hypothesis.
6. To whom or what does your conclusion apply? Discuss any limitations to your conclusion. If there is convincing evidence of a change in ability, discuss possible causes.
7. Cite the source from which you obtained your data.

Students should learn the learning targets presented in the unit summary along with how to find reliable data on the Internet, how to simulate using note cards, how to analyze this data, and how to make a logical conclusion about their findings.

Unit 4: Experiments

Guiding Question: Can You Visualize Success?

Students should learn to:

- Explain the concept of confounding and how it limits the ability to make cause-and-effect conclusions.
- Distinguish observational studies from experiments.
- Explain the purpose of comparison in an experiment.
- Explain the purpose of random assignment in an experiment and how to perform the

random assignment.

- Identify variables that should be kept the same in an experiment.
- Describe the placebo effect and the purpose of blinding in an experiment.
- State hypotheses for testing a difference in percentages for an experiment, and state the evidence for the alternative hypothesis.
- Use simulation to estimate a p -value for an experiment, and draw an appropriate conclusion.
- Describe a Type I and a Type II error in context.
- Explain the consequences of making each type of error.
- Explain how to reduce the probability of each type of error.

Unit Assignment(s): Experiments - Investigative Project

Students will design an experiment that compares two techniques and has a categorical response variable. They will then conduct their experiment, making sure to do the treatments in random order and keeping other variables the same. After each attempt, they will record which treatment was used and the outcome of the attempt. They will need to make sure they do at least 10 attempts with each treatment. Students will then write a report to include the following:

1. Write an introduction that states the question of interest and describes in detail how you conducted the experiment. Include the null and alternative hypotheses you are testing.
2. Display the results of your experiment in a two-way table and make appropriate graphs to compare your performances with the two treatments.
3. Calculate the difference in the percentage of success with each treatment and explain how this difference is evidence for the alternative hypothesis. Provide the two explanations for this evidence.
4. Describe how to use note cards to simulate the distribution of the difference of percentages, assuming the null hypothesis is true. Then conduct at least 10,000 trials of your simulation using the applet. Include a screenshot with the results of the simulation.
5. Use the results of the simulation to estimate the p -value. Then make a conclusion by explaining whether or not there is convincing evidence for the alternative hypothesis.
6. To whom or what does your conclusion apply? Discuss any limitations to your conclusion. Based on your conclusion, discuss which type of error you might have made.

Students should learn the learning targets presented in the unit summary along with how to conduct a randomize experiment, how to analyze the results of the experiment, and what type of error may have occurred in their study.

Unit 5: Conditional Probability and Strategy in Sports

Guiding Question: Should You Go for It on Fourth Down?

Students should learn to:

- Interpret the probability of an event as a long-run relative frequency.
- Use basic probability rules, including the complement rule, to calculate probabilities from a two-way table.
- Use the general addition rule to calculate probabilities.
- Calculate conditional probabilities from a two-way table.
- Justify if two events are independent.
- Use a tree diagram to model a chance process involving a sequence of outcomes.
- Calculate probabilities using the general multiplication rule.
- Calculate conditional probabilities using a tree diagram.
- Calculate probabilities using multiplication rule for independent events.

- Calculate a win probability in a particular context.
- Use win probability to determine when a strategy will be effective.

Unit Assignment: Conditional Probability and Strategy in Sports - Investigative Project

Students will create an example - or find a real-life example - where a coach has to make a strategic decision during a game being as detailed as possible. They will find the win probability for each of the coach's possible outcomes. Students will then write a report to include the following:

1. Write an introduction that describes the context for a strategic decision made by a coach or manager. Make sure to describe the context in detail, including the score of the game, when in the game the decision was made, and any other relevant details.
2. Clearly describe the options the coach or manager had to consider and discuss the possible outcomes for each option. Include the win probability for each possible outcome and interpret each of these values.
3. Display the possible outcomes in a well-labeled tree diagram. For the risky option, use p for the probability of success and $1 - p$ for the probability of failure.
4. Determine the minimum value of p that would make the strategy a good one. Show your work!
5. Briefly explain to the coach or manager how to use the value of p to make the decision.
6. To whom or what does your conclusion apply? Discuss any limitations to your conclusion.
7. Cite the source from which you obtained the win probability values.

Students should learn the learning targets presented in the unit summary along with how to compute probabilities with a tree diagram, complementary probabilities, and making decisions based off of probabilities.

Unit 6: Analyzing Quantitative Variables

Guiding Question: Do Rested Teams Play Better Defense?

Students should learn to:

- Construct a well-labeled dot plot.
- Describe the shape of a distribution of quantitative data.
- Construct a well-labeled histogram.
- Calculate the mean of a distribution of quantitative data.
- Calculate the median of a distribution of quantitative data.
- Calculate the range of a distribution of quantitative data.
- Calculate the quartiles and the *IQR* of a distribution of quantitative data.
- Describe the effect of outliers and skewness on measures of center and variability.
- Identify outliers in a distribution of quantitative data using the $1.5 \times \text{IQR}$ rule.
- Construct a boxplot to summarize a distribution of quantitative data.
- Compare the shape, center, variability, and outliers for two or more distributions of quantitative data.

Unit Assignment: Analyzing Quantitative Variables - Investigative Project

Students will choose an athlete, team, or league that they can analyze in two or more different contexts or two or more different athletes, teams, leagues, or groups of players that you can compare to each other. They will then choose a quantitative variable that they can use to measure performance. Students can find relevant data at websites such as www.sports-reference.com to look at Game Logs. Students will then write a report to include the following:

1. Write an introduction that states the questions of interest and briefly introduces the athletes, teams, leagues, groups, or contexts that you are comparing. Indicate which quantitative variable you will be using to make the comparison.
2. Display the distributions using both histograms and boxplots. Make sure to use the same scale to make the distributions easy to compare.
3. Calculate mean, median, range, and *IQR* for each distribution and display these values in a table for easy comparison.
4. Write a conclusion that compares the distributions using the characteristics shape, center, variability, and outliers. Make sure to address the question of interest.
5. Cite the source from which you obtained your data.

Students should learn the learning targets presented in the unit summary along with how to graph quantitative data and how to calculate summary statistics for quantitative data.

Unit 7: Comparing Two Means or Medians

Guiding Question: Do Sports Drinks Keep You Hydrated?

Students should learn to:

- Explain the concept of ability when analyzing quantitative data.
- State the hypotheses for testing a difference in ability, including the evidence for the alternative hypothesis.
- Explain how to simulate the distribution of a difference in means using note cards.
- Estimate a p -value using the results of a simulation.
- Determine if there is convincing evidence for the alternative hypothesis.
- Determine if a cause-and effect conclusion is appropriate.
- Estimate a p -value using technology.
- Test a claim about a difference in ability using the State-Simulate-Conclude process.
- Explain why comparing medians might be more appropriate than comparing means.
- Explain how to simulate the distribution of a difference in medians using note cards.

Unit Assignment: Comparing Two Means or Medians - Investigative Project

Students will choose an athlete (or team) and they can compare in two different contexts, such as home versus away or rested versus not rested. They will choose a quantitative variable that they can use to measure the athlete's or team's performance in the two different contexts. Students can find relevant data at websites such as www.sports-reference.com which contains Game Logs. Students will then write a report to include the following:

1. Write an introduction that states the questions of interest and briefly describes the context of the athlete's performances. Include the null and alternative hypotheses you are testing.
2. Display the two distributions using an appropriate type of graph so they can be easily compared. Write a few sentences comparing the distributions, making sure to provide appropriate summary statistics.
3. Calculate the difference in the mean (or median) value of the quantitative variable and explain how this difference is evidence for the alternative hypotheses. Provide the two explanations for this evidence.
4. Describe how to use note cards to simulate the distribution of the difference in means (medians), assuming the null hypothesis is true. Then conduct at least 10,000 trials of your simulation using the applet. Include a screenshot with the results of the simulation.
5. Use the results of the simulation to estimate the p -value. Then make a conclusion by explaining

whether or not there is convincing evidence for the alternative hypothesis.

6. To whom or what does your conclusion apply? Discuss any limitations to your conclusion or possible errors. If there is convincing evidence of a change in ability, discuss possible causes.

7. Cite the source from which you obtained your data.

Students should learn the learning targets presented in the unit summary along with how to compare two means or medians using graphs, hypothesis testing, and simulation.

Unit 8: Exploring Paired Data

Guiding Question: Can a swimsuit Make You Faster?

Students should learn to:

- Identify paired data in experiments and observational studies.
- Use a graph to analyze the distribution of differences in a paired data set.
- Calculate and interpret the mean difference in a paired data set.
- Identify if a cause-and-effect conclusion is appropriate.
- State hypotheses for testing a difference in ability using paired data, including the evidence for the alternative hypothesis.
- Explain how to simulate the distribution of a mean difference using note cards.
- Estimate a p -value using the results of a simulation.
- Determine if there is convincing evidence for the alternative hypothesis.
- Explain the benefit of using paired data.
- Estimate a p -value using technology.
- Test a claim about a difference in ability using the State-Simulate-Conclude process.

Unit Assignment: Exploring Paired Data - Investigative Project

Students will choose a group of teams or athletes that they can compare in two different contexts. They will choose a quantitative variable that they will use to measure each athlete's or team's performance in the two different contexts. They can find relevant data on the Internet at websites such as www.sports-reference.com at Game Logs. Students will then write a report to include the following:

1. Write an introduction that states the questions of interest and briefly describes the context of the team's or athlete's performances. Include the null and alternative hypotheses you are testing.
2. Include a table with the raw data, along with the differences for each pair. Display the distribution of the differences by using a dotplot. Write a few sentences describing the distribution, including the percentage of differences greater than and less than 0.
3. Calculate and interpret the mean difference and explain how this value is evidence for the alternative hypothesis. Provide the two explanations for this evidence.
4. Describe how to use note cards to simulate the distribution of the mean difference, assuming the null hypothesis is true. Then conduct at least 10,000 trials of your simulation using the applet. Include a screenshot with the results of the simulation.
5. Use the results of the simulation to estimate the p -value. Then make a conclusion by explaining whether or not there is convincing evidence for the alternative hypothesis.
6. To whom or what does your conclusion apply? Discuss any limitations to your conclusion or possible errors. If there is convincing evidence of a change in ability, discuss possible causes.
7. Cite the source from which you obtained your data.

Students should learn the learning targets presented in the unit summary along with how to analyze paired data with graphs, hypothesis testing and simulations.

Unit 9: More Measures of Variability

Guiding Question: Which 7-Iron is More Consistent?

Students should learn to:

- Use graphs to compare consistency for two or more distributions of quantitative data.
- Calculate and interpret the mean absolute deviation (MAD) for a distribution of quantitative data.
- Understand the properties of the MAD, including how it is affected by individual values.
- Calculate and interpret the standard deviation (SD) for a distribution of quantitative data.
- Understand the properties of the SD, including how it is affected by individual values.
- State the hypotheses for testing a difference in standard deviations, including the evidence for the alternative hypothesis.
- Explain how to simulate the distribution of a difference in standard deviations using note cards.
- Estimate a p -value using the results of a simulation.
- Determine if there is convincing evidence for the alternative hypothesis.
- Estimate a p -value using technology.

Unit Assignment: More Measures of Variability - Investigative Project

Students will choose an athlete, team, or group that they can compare in two different contexts and choose a quantitative variable that they can use to measure the athlete's or team's consistency in two different contexts. Students can find relevant data at websites such as www.sports-reference.com which contains Game Logs.

Students will then write a report to include the following:

1. Write an introduction that states the questions of interest and briefly describe the context of the athlete's, team's, or group of teams' performances. Include the null and alternative hypotheses you are testing.
2. Display the two distributions using an appropriate type of graph so they can be easily compared. Write a few sentences comparing the distributions, making sure to provide the mean and standard deviation for each distribution.
3. Interpret both of the observed standard deviations.
4. Calculate the difference in the observed standard deviations and explain how this difference is evidence for the alternative hypothesis. Provide the two explanations for this evidence.
5. Describe how to use note cards to simulate the distribution of the difference in standard deviations, assuming the null hypothesis is true. Then conduct at least 10,000 trials of your simulation using the applet. Include a screenshot with the results of the simulation.
5. Use the results of the simulation to estimate the p -value. Then make a conclusion by explaining whether or not there is convincing evidence for the alternative hypothesis.
6. To whom or what does your conclusion apply? Discuss any limitations to your conclusion or possible errors.
7. Cite the source from which you obtained your data.

Students should learn the learning targets presented in the unit summary along with how to find the mean absolute deviation and standard deviation of a data set and analysis of those values.

Unit 10: Standardized Scores and Normal Distributions

Guiding Question: Who Should I Draft for My Fantasy Baseball Team?

Students should learn to:

- Calculate and interpret a z-score.
- Compare performances on different scales using z-scores.
- Use z-scores to calculate a combined rating from performances on different scales.
- Sketch a normal distribution with a given mean and standard deviation.
- Use the 68-95-99.7 rule to estimate the percentage of values between two boundaries.
- Assess normality with graphs and the 68-95-99.7 rule.
- Use the standard normal table or technology to find the percentage of values in a specified interval.
- Use the standard normal table or technology to find the boundary value for a given percentile.

Unit Assignment: Standardized Scores and Normal Distributions - Investigative Project

Students will choose at least three athletic performances from different eras to compare. Then they will choose a group of comparable athletes for each of the selected performances. They will then find relevant data on the Internet at websites such as www.sports-reference.com. Students will then write a report to include the following:

1. Write an introduction that describes the questions of interest and identifies the performances you will be comparing. Explain why you selected the performances that you chose and give some historical background for each of the selected performances.
2. Describe how you chose which athletes to use as comparison groups for each of the selected performances.
3. For each of the selected performances, graph the distribution of performances for the comparison group of athletes. Draw an arrow on your graph to indicate where the selected performance falls in the distribution.
4. For each distribution of performances, calculate the mean and standard deviation. Then calculate and interpret the z-score for the selected performance.
5. Write a conclusion that answers the question of interest and describes possible errors or limitations to your research.
6. Cite the source from which you obtained your data.

Students should learn the learning targets presented in the unit summary along with how to find a z-score, how to use a normal probability chart, and to find the area under the curve.

Unit 11: Sampling with Confidence

Guiding Question: What Is America's Favorite Sport to Watch?

Students should learn to:

- Identify the population and sample in a sample survey.
- Describe how convenience sampling and voluntary response sampling can lead to bias.
- Explain how random sampling can help to avoid bias.
- Describe how to obtain a random sample using note cards or technology.
- Explain how other aspects of a sample survey can lead to bias.
- Understand the concept of sampling variability and the difference between performance and ability.
- Use simulation to approximate the standard error of a sample percentage and interpret the standard error.
- Calculate and interpret a 95% confidence interval for a percentage.
- Use a confidence interval to assess a claim.

- Describe the effect of changing the sample size on the margin of error.
- Use simulation to approximate the standard error of a sample mean and interpret the standard error.
- Calculate and interpret a 95% confidence interval for a mean.

Unit Assignment: Analyzing Categorical Variables - Investigative Project

Students will choose an athlete that they want to research. They will choose two different variables that they can use to estimate the athlete's ability. One of these variables should be categorical and one should be quantitative. They can find relevant data on the Internet at websites such as www.sports-reference.com at Game Logs. Students will then write a report to include the following:

1. Write an introduction that introduces the athlete and describes some interesting facts from the season you are researching. State the two different ways you will estimate the athlete's ability.
2. For the categorical variable:
 - a. Use an appropriate graph to summarize the athlete's performances and provide the single-value best estimate for his or her ability.
 - b. Use the applet to estimate and interpret the standard error for the estimated percentage.
 - c. Calculate and interpret a 95% confidence interval for the athlete's ability.
3. For the quantitative variable:
 - a. Use an appropriate graph to summarize the athlete's performances and provide the single-value best estimate for his or her ability.
 - b. Use the applet to estimate and interpret the standard error for the estimated mean.
 - c. Calculate and interpret a 95% confidence interval for the athlete's ability.
4. Cite the source from which you obtained your data.

Students should learn the learning targets presented in the unit summary along with different methods of sampling, how to find a confidence interval, and how to interpret the confidence interval.

Unit 12: Relationship between Two Quantitative Variables

Guiding Question: Teeing Off: Hit It Long or Hit It Straight?

Students should learn to:

- Distinguish explanatory and response variable.
- Construct a scatterplot to display the relationship between two quantitative variables.
- Describe the direction, form, and strength of an association displayed in a scatterplot, and identify unusual features.
- Interpret the correlation.
- Distinguish correlation from causation.
- Use technology to calculate the correlation.
- Describe how the correlation is influenced by outliers.
- Distinguish the observed correlation from the true correlation.
- State the hypotheses for testing a correlation, including the evidence for the alternative hypothesis.
- Explain how to simulate the distribution of the correlation using note cards.
- Estimate a p -value using the results of a simulation.
- Determine if there is convincing evidence for the alternative hypothesis.

Unit Assignment: Relationship between Two Quantitative Variables - Investigative Project

Students will choose an athlete, group of athletes, team or league that they are interested in investigating. They will then choose two quantitative variables and identify which variable will be the explanatory variable. Students can find relevant data at websites such as www.sports-reference.com which allows them to look at statistics for all the teams and players in a league (game logs will also allow them to collect game-by-game data). Students will then write a report to include the following:

1. Write an introduction that states the questions of interest. Briefly describe the context of the research. Include the null and alternative hypotheses you are testing.
2. Construct a well-labeled scatterplot to display the relationship between the explanatory variable and the response variable. Describe the association in a couple of sentences.
3. Calculate and interpret the correlation. Explain how the observed correlation provides evidence for your alternative hypothesis. Provide the two explanations for this evidence.
4. Describe how to use note cards to simulate the correlation, assuming the null hypothesis is true. Then conduct at least 10,000 trials of your simulation using the applet. Include a screenshot with the results of the simulation.
5. Use the results of the simulation to estimate the p -value. Then make a conclusion by explaining whether or not there is convincing evidence for the alternative hypothesis.
6. To whom or what does your conclusion apply? Discuss any limitations to your conclusion or possible errors. Based on your conclusion, is it reasonable to say there is a cause-and-effect relationship between the two variables.
7. Cite the source from which you obtained your data.

Students should learn the learning targets presented in the unit summary along with how to make a scatterplot, find the correlation, and know the difference between correlation and causation.

Unit 13: Using Relationships to Make Predictions

Guiding Question: How Can We Build a Better Baseball Team?

Students should learn to:

- Use a model to make predictions.
- Calculate and interpret a residual.
- Use the concept of least squares to choose a model.
- Make predictions using a least-squares regression line to calculate and interpret residuals.
- Use a least-squares regression line to calculate and interpret residuals.
- Interpret the slope and y intercept of a least squares regression line.
- Use technology to calculate the least-squares regression line.
- Use a residual plot to assess whether a model is appropriate.
- Interpret the standard deviation of the residuals.
- Use technology to construct a residual plot and calculate the standard deviation of the residuals.
- Use the standard deviation of the residuals to identify which explanatory variables provide the best predictions.
- Explain the influence of outliers on the equation of the least-squares regression line and the standard deviation of the residuals.
- Recognize and explain the concept of regression to the mean in a sports context.

Unit Assignment: Using Relationships to Make Predictions - Investigative Project

Students will research an athlete, group of athletes, team, or league and choose a response variable and at least two explanatory variables that can be used to predict the response variable. Students can find relevant data at websites such as www.sports-reference.com which allows them to look at statistics for all the teams and players in a league. They can also look at game logs for individual players or teams, and collect game-by-game data. Students will then write a report to include the following:

1. Write an introduction that states the questions of interest. Briefly describe the context of the research. Include the explanatory variables that you will be investigating.
2. For each of the explanatory variables:
 - a. Create a scatterplot to show the relationship between the explanatory variable and the response variable. Describe the association in a couple sentences.
 - b. Calculate the equation of the least-squares regression line. Interpret the slope.
 - c. Calculate and interpret the standard deviation of the residuals.
3. Use the scatterplot and calculations in Step 2 to answer the question of interest.
4. To whom or what does your conclusion apply? Discuss any limitations to your conclusion or ideas for future investigation.
5. Cite the source from which you obtained your data.

Students should learn the learning targets presented in the unit summary along with how to compute a least-squares regression line, the use of technology to find the line, how to make a scatterplot, and how to make a residual plot.

Budget- budget figures must be included even if they are an estimate.

Projected Costs	Start-up	Ongoing
Personnel (Not to include classroom instructor unless a new section is needed)		
Instructional Material Supplies per student (textbooks, software, etc.)	50,000	
Services (training, equipment maintenance, contracts, etc.)	6,000	
Capital Outlay (remodeling, technology, etc.)		
Total Projected Costs	56,000	

Instructional Materials- must include estimate for new materials even if none have been selected. Place in chart above.

Type	Publisher	Title	ISBN	Author	Copyright	# Have/Need
Textbook	W. H. Freeman	Statistical Reasoning in Sports	978-1-4641-4233-8	Josh Tabor and Christine Franklin	2010	500 needed

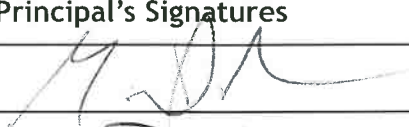
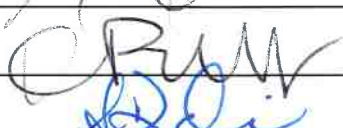
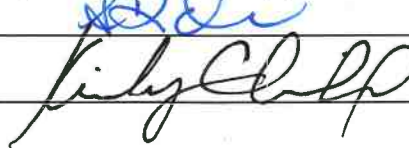
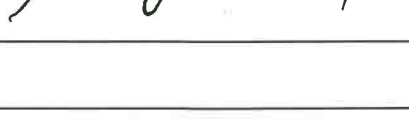
Funding Source(s) for Costs and Instructional Materials

Grants (indicate specific grant and grant timeline)	
Categorical Funds (include related programs)	
Career Technical Education (must be for an approved CTE course)	
Department Funds	
Other (be specific)	

Appendix of Additional Documents

<u>* Required additional documents include meeting minutes where the course was discussed and approved</u>

District Principal Review and Approvals:

Principal's Signatures	Site	Approved / Not Approved
	EATS	Approved
	McHS	Approved
	PHS	Approved
	SRHS	Approved

District Department Chair Review and Approvals:

Department Chair Signatures	Site	Approved / Not Approved

*please see attached minutes -
department chairs approved @
12/2/19 steering committee meeting.*



7 – 12 Math Steering Committee Meeting

Agenda and Minutes

Dec. 2, 3:45 -5:00 pm

T and L Conference Room

Embrace-Engage-Empower

SRCS Vision Statement: SRCS will send students into the world who are empowered to work together, find purpose, think critically, embrace diversity, adapt to our changing planet, and live healthy and fulfilling lives

SRCS Mission Statement: SRCS ensures equitable access to a transformative educational experience grounded in the assets of our students, staff, and community. We nurture the whole student in an engaging, challenging, and safe environment. We recognize and value each student's individuality and our community's cultural wealth.

SRCS Theory of Action

If we improve the quality of practice through the continuous development of leadership capacity to:

- Facilitate the development of a sense of purpose
- Recognize and implement quality instruction
- Lead and guide focused on professional learning
- Confront and address issues of equity and access
- Provide and strengthen social and emotional supports
- Engage in problem solving through an inquiry cycle for growth
- Ensure warm, safe, dry schools and facilities
- Utilize data to inform the inquiry cycle for growth
- Target and align resources

Then, we have much work to do as a district. No longer will student outcomes be predicted based on race, disability, socioeconomic status, and/or the language spoken at home.

Members Present: Jon Giacomini (EAHS), Lisa Moore (Cook MS), Angela Ghigliazzi (Comstock MS), Ted Seche (MHS), Scott Paine (SRMS), Kateland Weighall (RVMS), Margie Bradylong (MCHS), Eric Bohn (SRHS), Matt Gariss (Slater)

Members Absent: Michael Papaik (PHS), Julie Peterich (RHS),

Guests: Valerie Jordan, RHS

Topic	Outcome/Agreements
Welcome and Check in	
Math 3 and Math 3H sign off	HS chairs signed off on Math 3 and Math 3H
third year math options: Business Math and Stats for Social Justice	Does a student have to take Math 2 or can they take a different course that is "c" approved?
Reminders:	Messaging about Math 1A and Math 1B still not accurate per information told to department chairs by counselors.

<p>Question from last meeting: RSP and SDC to meet math graduation requirements: we do have Math 1A and Math 1B for IEP students; does earn 20 credits; Math 1A is "c" approved</p>	<p>Question: why can't others be in the two-year math course as this meets students where they are?</p> <p>SRHS has 110 sophomores in Math 1</p> <p>math elective support class worked for some at SRHS; was asked if they wanted again but would come out of math sections</p> <p>ideas: life skills class like AVID, math support classes</p> <p>3rd year math option seems contrary to Board intent and equity</p> <p>Business Math signed off as an option for a third year of math- this can serve as a place holder for another course to be named later; Department chairs approved Statistical Reasoning in Sports as a third year option for math. Eric Bohn wrote the course and submitted on December 3, 2019.</p> <p><u>BP 6146.1</u></p>
<p>Counselors:</p> <ul style="list-style-type: none"> • can a validated math course earn credit? • what interventions do we have to support students in the moment? • reviewing board policy re: math Thursday at Lewis Center at 3:30 - 5:00 	<p>see board policy above</p>
<p>PD days - choose preferred day per group per site (2 total)</p> <p>Jan. 21, 22, 23/ April 7,8,9</p>	<p><u>curriculum planning spreadsheet</u></p> <p>Cannot have SRHS, MCHS and RVMS on the same day (Jan. 21). Someone needs to move (MCHS did, thank you MCHS!)</p> <p>please stay to dates that have been reserved for math- much work has been done to keep subs to less than 30 for PD each day</p>

Upcoming meeting dates. All meetings in T and L Conference room from 3:45 - (highlighted meetings are full steering; meetings beyond the four will be compensated)

Dec. 11 (MS only) Jan. 27 Feb. 24 March 30 April 20 May 11

Parking lot:

east west divide: do west side teachers feel disrespected by east side? needs to be unpacked and healing