INDIGENOUS WISDOM:
CENTURIES OF PUEBLO IMPACT IN NEW MEXICO

A Pueblo-Based Educational Curriculum • IndianPuebloEducation.org

HIGH SCHOOL CURRICULUM

2nd Edition

Title of Unit: The Competition for Self-Sufficiency through Gaming

Content Area: Social Studies: U.S. Government

Grade Level: 9-12

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Section A: Introductory Materials
Name: Regina Jojola Lucero
Title of Unit: The Competition for Self-Sufficiency through Gaming
Content Area: Mathematics - Statistics
Grade Levels: High School

Rationale:

This unit is connected to three very important core values of Pueblo People. The first is Compassion; this is the expression of empathy, concern, and kindness toward humanity such as the act of providing for those in need. Gaming Revenue is a very important source of revenue in helping the pueblo achieve self-sufficiency. This revenue is used toward education, youth and elderly services, and other programs to help their people. The second core value in this unit is Balance; this core value is connected to the concept of sharing.
While the revenue generated from casinos is shared with the state for exclusivity, it also represents sharing, as sharing includes the jobs that gaming creates for surrounding Pueblo communities. The third core value is Service; this is the act of helping one's family, local community and the community at large. This unit looks at how spread out the revenue is from the mean, which tribes consistently operate within one standard deviation of the mean, and which tribes are far from the mean in either direction. These types of analysis can help tribes predict how well their casino is going to do and how their competition is currently doing.

In 1988, Congress established the IGRA (Indian Gaming Regulatory Act) as the federal regulatory scheme to govern Indian gaming throughout the United States. The act itself established Indian gaming into three classes: Class I, II, and III gaming. (http://www.nmgcb.org/history.aspx)

In 1997, the U.S. Court of Appeals for the 10th Circuit in Pueblo of Santa Ana v. Kelly reasoned very similarly to the New Mexico Supreme Court decision in State ex. Rel Clark v. Johnson, ruling that the Governor lacked authority to bind the state to the compacts and thereby did not comply with IGRA. The 1995 gaming compacts were then introduced to the 1997 New Mexico Legislative Session to comply with the court rulings. Revenue sharing and the compacts were finally approved by the legislature and signed by Governor Gary Johnson (http://www.nmgcb.org/history.aspx).

These two points on the 100-year timeline had a very significant impact on the tribes achieving self-sufficiency and building their own economic resources.

Unit Goals:

1. Students will be able to use descriptive statistics to summarize data in gaming revenue.
2. Students will be able to calculate the variance and standard deviation of gaming revenue and interpret results.
3. Students will be able to consider the nature of data and statistical results and use appropriate graphical representations to display data.

The content of this unit deals with analyzing gaming revenue and looking at the state of the different gaming tribes in regards to their mean revenue. Tribes will be able to tell who is outdoing their completion and who is at risk. This connects with the core values of Service because the tribes strive to maintain and increase revenue to support their people. This unit connects to the core value of Balance because the revenue of gaming tribes is shared with the state, providing jobs for surrounding communities. The last core value is Compassion; the management of the casinos operates to maximize revenue in order to help the communities in need of several service programs, such as education and elderly programs.

The focus of this unit is to analyze data by using standard deviation to determine which tribes are generating revenue close to the mean, and which tribes are exceeding the norm. Students will analyze, make predictions, and give suggestions for the struggling tribes.

Standards:

Common Core Standards	Common Core Standards for Mathematical Practice
HSG.ID.A.2 HSG.ID.A.3	CCSS.MATH.PRACTICE.MP1 CCSS.MATH.PRACTICE.MP2 CCSS.MATH.PRACTICE.MP3 CCSS.MATH.PRACTICE.MP5 CCSS.MATH.PRACTICE.MP6

Section B: Lesson Plan One

Title: Determining the mean gaming revenue (i.e., Net Win) for New Mexico Tribes-High School

Duration: 60 minutes

Grade Level: High School

Lesson Objectives:

a. Students will be able to calculate the mean of a data set.
b. Students will be able to use the mean value to explain results within the provided context.

Prerequisite Knowledge and Skills:

1. Adding
2. Subtracting
3. Division
4. Sequencing

Materials and Resources

1. Calculators
2. Poster paper, notebooks (to take notes)
3. Scissors and glue

Guiding Questions:

1. How does one choose a measure of central tendency to explain data?
2. How does one use a graphical presentation to display data?

Core Values: Balance

Procedure:

- Bell ringer (5 minutes):
  - What is the average number of siblings in this class?
  - How do you calculate this number?
  - How do you interpret the result?
- Vocabulary (10 minutes)
  - Measures of central tendency
  - Mean
  - Revenue (or "Net Win")

Each student fills out a copy of the following graphic organizer, using it as a reference throughout the lesson.

Mean	Definition:	How to calculate:
Revenue/ Net Win	Definition:	Example:

- Examples (10 minutes):
  - Teacher models how to solve for the mean using a small data set; such as the number of pets, commuting distance from home to school, and number of shoes at home.
  - Teacher surveys the class and writes on the board.

Example of a data set of the number of siblings: 1, 2, 2, 4, 3, 3, 5, 6, 2, 3, 1

Determining the mean: add all numbers and divide by the number of data points

$$\frac{1+1+2+2+2+3+3+3+4+5+6}{11} = \frac{32}{11} \quad = \text{approx.. } 2.9$$

- Activity (20 minutes):
  - Students work in groups of four to find the mean gaming Net Win for tribes in a given year or quarter. This allows them to compare their data with other groups and draw inferences.
  - Each group receives data from each quarter along with poster paper. (Teacher can have the students cut out and paste data on poster paper so that it is clearly displayed.)
    - For this, two data sheets are given, one for students to cut and one to keep as a reference when answering questions about the performance task at the end.
  - The data for quarterly Net Wins can be obtained through the following link http://www.nmgcb.org/revenue-sharing.aspx. (Students may round to the nearest hundred thousand: 1,863,456 would be 1.9 million.)
  - Students calculate the mean of the data sets.

Sample student work:
Tribe XYZ from Year #### to Year ####
Annual Net Win data set: _____
Mean: _____

- Informal Assessment (20 minutes)
  - Students present their findings. (Save posters for the next day's activity.)
  - Students may choose to compare one tribe with another, track growth or decline over time, or report interesting patterns
  - Teacher may ask the following:
    - Looking at the data sets, what are some interesting patterns and/or similarities or differences over the years?
    - How does the mean change from 2002 to 2015? What are possible explanations for the change?

Lesson Plan Two
Title: Determining the variance and the Standard Deviation of revenue data
Duration: 60 minutes
Grade Level: High School

Lesson Objectives:

a. Students will be able to calculate the variance of a data set by hand or with the aid of a calculator or spreadsheet.
b. Students will be able to calculate the standard deviations of a data set.
c. Students will be able to interpret results.
d. Students will be able to use variability of distributions to explain data.

Materials and Resources:

1. Posters from the previous day; new poster paper
2. Markers
3. Calculators
4. Notebooks
5. Vocabulary graphic organizer

Guiding Questions:

1. What does a measure of the spread of a data set mean?
2. How does one compare the variability of data sets?
3. How does one measure a standard deviation from the mean?

Core values: Service

Procedure:

- Bell ringer (5 minutes):
  - Describe the procedures to calculating the mean by hand.
  - Find the mean of the following: 12, 23, 15, 12, 15

- Vocabulary (10 minutes)- students take notes as teacher reviews or introduces vocabulary
  - Variance and Standard deviation

Variance	Definition:	How to calculate:
Standard Deviation	Definition:	How to calculate :

Sample student work:

Variance ( )	***Definition;*** ***The average of the squared differences from the mean***	***How to calculate:*** 1. ***For each data point subtract the mean and square the result*** 2. ***Then add them all and divide by the total number of data points to find the average***
Standard Deviation (	***Definition:*** ***Is the measure of how spread out the numbers are from the mean.*** The **standard deviation is calculated** as the square root of variance by determining each data	***How to calculate:*** $\mathrm{SD} = \sqrt{\frac{\sum \lvert x - \bar{x} \rvert^2}{n}}$

	point's **deviation** relative to the mean. If the data points are further from the mean, there is a higher **deviation** within the data set; thus, the more spread out the data, the higher the **standard deviation**.	

- Teacher modeling (10 minutes):
  - Teacher provides the number of siblings as data
    - Students calculate the variance by hand and calculator.
    - Students calculate the variance and the standard deviation.
    - Teacher may discuss interpreting the standard deviation with frequency distributions according to the Empirical Rule.
      - For bell-shaped distributions, about 68% of the data will be within one standard deviation of the mean; about 95% will be within two standard deviations of the mean; and about 99.7% will be within three standard deviations of the mean.
- Students share their findings (15-35 minutes depending on the number of groups).
  - Create a handout or post the following questions on the board to facilitate classroom discussion:
    - Did the standard deviation change over the quarters?
    - Did they get more spread out or less spread out?
    - Did you see any trends?
    - One standard deviation is said to be within the normal range; which of the tribes operated within the standard deviation?
    - Which tribes are more than one standard deviation to the left of the mean? Can we say those are at risk? Why?
    - Which tribes are operating more than one standard deviation to the right (or higher)? Can we conclude that they are outdoing the competition and leading the industry? How?

Lesson Plan Three

Title: How spread out are the tribes' deposits to the general fund to assist the state economy?

Duration: 60 minutes

Grade Level: High school

Lesson Objectives:

a. Students will be able to apply statistical thinking to a real -world problem.
b. Students will be able to interpret a numerical characteristic of a population or a statistical model.

Prerequisite Knowledge and Skills:

1. Mean
2. Variance
3. Standard deviation

Materials and Resources:

1. Poster paper; markers
2. Calculators

Core values: Balance, Service, Compassion

Procedures:

- Bell ringer (5 minutes)**:**
  - Students calculate the mean, variance, and standard deviation of the data provided by the teacher.
  - Students interpret the results.
- Performance Task (45 minutes):
  - Students are given a new data set to analyze gaming finances and the revenue sharing to the State's general fund.
  - Teacher reads the following: Often times the tribes' contributions to the communities and residents of the state of New Mexico go by unnoticed. The tribes share their gaming revenue with the state to get the right of exclusivity. The following data set shows the revenue sharing of the tribes (in quarterly deposits) to the State of New Mexico General Fund, according to the New Mexico Gaming Control Board website.

Student Data: Deposits to the State of New Mexico General Fund

Yr 2002	**Yr 2004**	**Yr 2008**	**Yr 2015**
Q1: $7,668,594.61	$9,408,764	$16,247,287.64	$16,787,781
Q2: $7,889,191.50	$9,370,771	$16,968,436	$17,306,042
Q3: $8,041,901	$9,540,222.32	$16,711,228	$16,307,344
Q4: $7,776,293	$9,977,454.87	$15,330,974	$15,407,340

  - Students calculate the mean, variance, and standard deviation of the data set.
  - Students interpret the results and respond to the following questions.
    - As the year passes, what do you notice about the revenue sharing? What does this mean?
    - Use the standard deviation to explain data according to the Empirical Rule.
    - How many standard deviations away from the mean is the Q4 2015 deposit to the State of New Mexico? Explain.
  - Teacher can use the rubric provided below.

Rubric for grading

score	4	3	2	1
Math Portion	All solutions are accurate	Evidence of work with some errors	Some attempt but several errors	Very little attempt
Answers to questions	Clear and cited with evidence to justify academic vocabulary	Answered all questions but did not use academic vocabulary or justification	Answered half of the questions	Very little attempt
Appearance/ presentation	Very well organized, a neat, clear presentation	Somewhat organized, good presentation	Attempted to organize data results but did not follow the flow, struggled with presentation	No organization, no presentation
Total points				
Comments:				
Final score:				

Modifications:

- Provide pre-printed notes on the procedures to help students calculate the mean, variance, and standard deviation.
- Students may use a calculator or spreadsheet for the calculations.
- Students may need lab support to use calculator or spreadsheet.
- Small group work with mixed abilities
- Multiple Intelligences (using visuals to help make sense of mathematical concepts)
- Review of vocabulary prior to lessons to promote and connect with students' prior knowledge
- Extended time to complete assignments

Notes to Teacher:

Teacher may have students research various social, financial, and political issues related to revenue sharing and how gaming revenue has been used for the Tribes or the State of New Mexico.