6th Grade Statistics
Dr. David L. Turner
William T. Tilden Middle School

Abstract

This unit assist teachers in the development and understanding of statistics. Students will focus on understanding the uses of statistical questions and their connection to data use in math moving towards the best measure of center and measure of variation for a set of data. There are four interactive sessions between the teacher and the student. Session 1 involves the application and conceptual understanding of the mean**.** Session 2 involves the application and conceptual understanding of Mode and Median. Session 3 involves the application and conceptual understanding of the Best Measure of Center. Session 4 involves the application and conceptual understanding of measure variation. Sessions 4 is a cumulation of lessons 1-4, which illustrate the mode, median, mean, range, outlier, gap, cluster, measures of center and measure of variation. The last lesson moves to find the interquartile range while illustrating the median for the set of data, branching off to the median for the first quartile and the third quartile. The teacher will explore the PowerPoint with students in flexible group to practice the application and conception of skill of using data to decide how to best represent the center and the measure of variation in a set of data.

Content Objectives

Problem Statement:

Teaching student Statistics in grade 6 has proven to be a challenge as my students have demonstrated the difficulty of understanding the importance of statistics in their daily lives and the true purpose of statistics. I have learned that my students have a difficult time understanding what is or not a statistical question, how to read data (charts and graphs), or even how to interpret their meaning and purpose. The students that I serve are an at-risk student population within Philadelphia. Many of my students are first-generation immigrants from war-torn countries or have been impacted by adverse experiences in their crime-ridden and low-income neighborhoods. In their case, statistic serves no purpose in their lives. Therefore, it is difficult teaching them the application and conceptual knowledge to understand and interpret statistics.

Despite such a long history of educators and parents striving to provide the best possible setting and services to children in the Philadelphia area. Educators are facing new and significant challenges that require them to use various approaches to educate their current student body. The at-risk student population I serve, consists of over 95% of the population who are economically disadvantaged; 100% of the study body qualifies for free lunch; about 20% of the student body is enrolled in special education. Also, it has a rivaling population between the African descent student population and the African American student population, which was resolved through professional development and preventive measures by the district. The challenge of being in a high-crime (often considered as having the highest crime rate in the Philadelphia County) and low socioeconomic community. Most importantly, many of my students come from adverse

childhood experiences (poverty, neglect, abuse, and worn-torn countries), which has greatly impacted their academic performance at the school. It is difficult to get them to understand and interpret statistics, which will be used in their academic journey and their daily lives.

The general problem is teachers in urban areas teach at-risk children (low-income, poor health, and poor attendance), and various ethnic backgrounds, which tends to hamper their academic performance. Teachers in this setting must tailor lessons with pedagogical concepts and strategies, which best fit the needs of their students to ensure engagement in the classroom (Edmonds, & Li, 2005; Means, Toyama, Murphy, & Baki, 2013). Teachers are also encountering challenges of engaging diverse groups of students in a blended learning classroom and regular classroom (Balfanz, Herzog, & Mac Iver, 2007; Riel, Lawless, & Brown, 2016). Middle and high school students in an urban setting tend to misbehave, not attend school regularly, and not be engaged in their academic assignments (Balfanz, Herzog, & Mac Iver, 2007; Riel, Lawless, & Brown, 2016). I believe an interactive way of teaching statistics such as visualization and comic may engage them in wanting to understand and interpret statistics or mathematics.

The specific problem is teachers instructing at-risk children (low-income, poor academic performance, various languages and various ethnic backgrounds) use pedagogical concepts that best fit their students' needs to ensure engagement occurs in the classroom (Edmonds & Li, 2005; Means, Toymana, Murphy & Baki, 2013). Students are not performing well in math due to the gaps in skills. A student may not have grade-level skills or backgrounds to perform well in their current grade. Students require a process or best practices, which can close the gap in their learning such as interactive lessons.

"A Visual Approach to Learning Math" seminar has sparked the development of ideas on the topic of mathematical visualization for sixth-grade statistics within me. I coming to realize that the visualization of teaching statistics can be instrumental when instructing students in the classroom. For instance, I have prepared four interactive presentations that will use number lines, letters, or objects to illustrate averages, clusters, peaks, and outliers that students while being manipulated to perform the required task to engage students in a lesson.

The use of visualization by the usage of technology and best practices in a math unit for the purpose to improve teaching and learning in the classroom critical to enhance the engagement of students in the classroom. This math unit will encourage teachers to be creative as they take away from the unit and may cause them to develop their way to illustrate and animate mathematics at a variety of levels. This unit will explore how teachers can evaluate complex problems in an animated medium where students can explore their ideas, thoughts, and questions generated from the exploration of statistics. The understanding of statistics will assist students in their interpretation of the world (Walle, Karp & Bay-Williams, 2019). The unit will guide instruction for students to reach

their academic potential in the classroom, which allows them to meet the common core standards. This unit will be linked to a mathematical application while addressing the conceptual knowledge of math for the student. This unit will aid in the increase of appreciation for statistics, may increase academic performance on state assessments, and for teachers to develop a fun and engaging approach to the math in their classroom.

Session 1 involves the application and conceptual understanding of the mean. This portion of the unit on statistics begins with the understanding of whether a question is statistical on nonstatistical while leading to formulating statistical questions. Then, the lesson involves the understanding of the meanwhile leading to calculating a data set to derive at mean. Citizens will have to address questions that are statistical or nonstatistical in their daily lives, which provides the necessary reason to teach this concept to children that are exposed to these types of questions in their math class and daily lives. The use of visualization allows the student to engage in the lesson and visibly see the concept being taught in class.

Session 2 involves the application and conceptual understanding of Mode and Median of a set of data. The lesson illustrates the mode is number in the data that occurs the most. The visual presentation allows students to conceptualize the mode of a set of data. The lesson moves to understand the median as the middle number. The visual presentation allows students to visualize the median in a set of data. Also, the teacher discusses mode, median, and mean of a set of data. The mode and median are not affected by the data as the mean (Walle, Jarp & Bay-Williams, 2019).

Session 3 involves the application and conceptual understanding of the Best Measure of Center. The lesson illustrates the mode, median, mean, range, outlier, gap, and cluster in a set of data. The visual presentation allows students to conceptualize the mode, median, mean, range, outlier, gap, and cluster in a set of data through an interactive lesson in PowerPoint. The teacher will show students within flexible groupings that it is important to consider the context and data to decide how to best represent the center (Walle, Jarp & Bay-Williams, 2019).

Session 4 involves the application and conceptual understanding of measure variation. The lesson illustrates the mode, median, mean, range, outlier, gap, and cluster in a set of data. Then, the lesson moves to find the interquartile range while illustrating the median for the set of data, branching off to the median for the first quartile and the third quartile. The students are shown how to determine the range of the first quartile from the thirds quartile to get the interquartile range. The visual presentation allows students to conceptualize the mode, median, mean, range, outlier, gap, cluster, and process to get the interquartile range in a set of data through an interactive lesson in PowerPoint. The teacher will show students within flexible groupings that it is important to consider the context and data to decide how to best represent the center and the measure of variation in a set of data.

Teachers can create a free google classroom for the use in the classroom. Google is a learning management system. The teachers can allow their students join their classroom for free using the code generated by google. Google classroom allows teacher to upload assignments for their students to complete. The teacher can grade their students work in google and it provides a spread sheet of the graded work. Teachers can use google to load presentations for their students to review in the classroom or at the student's home. Teachers can add power point presentations to their google classroom. This site is compatible with all components of google applications (drive, docs, slides, forms, sheets and meets etc.). Teachers can create a google classroom by viewing this YouTube video titled, "The New Google Classroom – Full Tutorial" or click the link in the parenthesis (https://www.youtube.com/watch?v=M6L-nZGIUTE)

Teachers can adapt the slides presentations associated with this unit to accommodate their student learning. Teachers can upload their PowerPoint presentation to google slides to to incorporated into google classroom (https://www.youtube.com/watch?v=yN4QfhY72OA or https://www.youtube.com/watch?v=cBvxnYsiykY). The slides with will assessible as long as they have access to their google drive or google classroom.

Teaching Strategies

Essential Questions
Essential questions are questions, which are used to set a purpose for the lesson. Students will be able to answer the essential questions after the lesson.

Modeling
Modeling allows the teacher to show students their thinking process and how the problem can be done.

Motivational Moment
The motivational moment is a time where the teacher shows an inspirational video to the class from YouTube. The motivational moment will focus on a method that the teacher wants the students to grasp while they are in their class and can perform throughout their life.

Flexible Grouping
Flexible grouping allows the teacher to teach children who have similar needs or on the same level. The teacher may use student data to formulate flexible groups for instruction to present material at their ability level.

Differentiated Instruction

Differentiated instruction is the technique involving various teaching styles to address the needs of the class, group, or and individual. The teacher will use differentiated instruction to address flexible groups of students based on their ability.

Note-taking
Students will copy notes assigned to them by the teacher from the SMARTboard or textbook into the notebooks. The teacher will instruct students that they are to study their notes daily to recall information take in previous sessions or develop clarifying questions for the upcoming lessons. The teacher can do a status of the class to ask if there are any questions.

Warm-up
Warm-up are exercises that will aid student understanding of the topic. Warm-up may include skills they already know or introduce a topic. The teacher will work with students in their flexible groups to complete the assignment. Student will generate their response and then check with the group. The teacher can do a status of the class to ask if there are any questions.

Demonstration of Learning (DOL)
Demonstration of Learning is an assessment, which is aligned to the standard and lesson objective. Student will complete the DOL to illustrate and justify their learning of the lesson objective.

Classroom Activities
Session 1: Mean

Motivational Moment: Play
- https://www.youtube.com/watch?v=MJoczdESU24

The teacher will play a motivational video before the start of the formal lesson to inspire their students to work together. The teacher will explain that a few people working together will form a small group, which could lead to a large group working together. You may not succeed the first time but keep trying. Many of our assignments may involve individual work, small group and large groups to complete a task, but together will reach the common goal or outcome.

*Material*s:
- PowerPoint Presentation
- Smartboard or Projector
- Pencil
- Paper
- Calculator

Teachers inform students what they believe should go into their notebook while teaching the lesson.

Standards
- **6.SP.A.2** Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.

- **6.SP.A.3** Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number. (Miles & Williams, 2016)

Interpretation (What do students need to know and be able to do?) of standard for this lesson plan:
- Understand that data collected to answer a statistical question can be analyzed by their distribution.
- Calculate mean.
- Describe a set of data using its center (mean, median, and mode), spread (range), and overall shape.
- Create a line plot, histogram, and a box plot. (Miles & Williams, 2016)

Objective:
- Student will be able to understand that data generated from statistical questions vary IOT understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.
- Student will be able to identify the differences between a statistical and no-statistical question IOT understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.
- The student will be able to recognize the responses to statistical questions have variations that can be to conclude the data set to recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

Essential Questions:
- How can you tell whether a question is a statistical question?
- How can you find the mean value of a data set?

Activity/Task

Warmup:

The teacher will explain data generated from statistical questions will vary and data from a non-statistical question will have a set answer? Students will determine whether the questions below are statistical or non-statistical and then have a discussion with their group and form group consciences:

- How many teachers are assigned to this school?
- How many teachers are assigned to every school?
- How many counties are there in the state of Pennsylvania?
- What is your favorite type of pizza?
- How many teams won the NBA Championship?
- What career will teens at this school chose to pursue after high school?

Vocabulary:
Student will copy the vocabulary and their definitions into their notebook
- **Mean**: the value obtained by dividing the sum of several quantities by the number; an average.
- **Average**: a number expressing the central or typical value in a data set, in particular the mode, median, or (most commonly) the mean, which is calculated by dividing the sum of the values in the set by their data number.
- **Outlier**: something that lies outside the main set of data.

Background Information:

The teacher will read to class: V & S Elmwood Lanes located at 7235 Elmwood Avenue, Philadelphia, Pa. has a history spanning over fifty years in the southwest community. Mr. & Mrs. Steve Fred has invested their business into the community and people supporting their business. The Fred's provide fundraising activities to various organizations and schools. The Fred's host their annual Christmas party for the students of parents of Tilden Middle school were their guests eat a delightful dinner and are showered with gifts from V & S bowling lanes. Mr. & Mrs. Fred host Jimmy's Juniors Youth Bowling League where bowlers have mentors, which teaches and inspires youth from ages 6-18 in the sport of bowling, friendship, sportsmanship, and life.

Differentiated Instruction
The teacher will use differentiated instruction to address flexible groups of students based on their ability to show and discussing the YouTube video below and working out a smaller section of the problems with their students.

https://www.youtube.com/watch?v=B1HEzNTGeZ4

https://www.youtube.com/watch?v=oaFKTrD_fZk

Teacher will model the problem below for their students:
V& S Elmwood Lanes
- You bowl the following values:

    50, 70, 60, 70, 100

- What is your outlier?

    50, 60, 70, 70, 100

            My outlier is 100.

- What is the mean?

    50+ 60+ 70+ 70+ 100= 350   350 ./. 5 = 70

    My mean is 70

Large/Small Group Instruction:
The teacher will provide instruction in a large group or small group setting. The teacher will provide time for students in their flexible groups and the teacher to discuss and present their answers to the class. Students in their flexible groups and the teacher will work together to solve the problem below:

Family & Friends Day at V & Elmwood Lanes
You and a friend bowled four-game each and your scores are as follows: 70, 60, 60, 65, 80, 90, 40, 110. What is your outlier? What is the mean? What is the mean without the outlier?

    40, 60, 60, 65, 70, 80, 90, 110

        Our outliers are 40 and 100.

$$40 + 60 + 60 + 65 + 70 + 80 + 90 + 110 = 575 ./. 8 = 71.88$$

Our mean is 71.88 with the outliers.

$$60 + 60 + 65 + 70 + 80 + 90 = 425 ./. 6 = 70.83$$

Our mean is 71.88 without the outliers.

Students will work in their flexible groups and present their findings:
Jimmy's Juniors Youth Bowling League

Group Assignment

Your team bowled the following scores: 70, 60, 60, 65, 80, 90, 40, 110.

> What is your outlier?

> What is the mean?

> The mean without the outlier?

Explain which method is best to represent the data Group Assignment
Your team bowled the following scores: 70, 60, 60, 65, 80, 90, 40, 110.
> What is your outlier?
> What is the mean?
> The mean without the outlier?

Explain which method is best to represent the data

Demonstration of Learning:
Students will do the demonstration of learning activity independently. Demonstration of learning activity will be used as an assessment to show the student's mastery of the standards and objectives of the lesson.

Name: _____ Section_____
<u>Demonstration of Learning</u>

Part A:
Directions: For the past ten weeks, you have gone bowling at V & S Elmwood Lanes. You recorded your weekly scores in your notebook. You recorded 60, 60 80, 80, 80 70, 70, 90, 100, and 150. Make a dot plot for the data value 60, 60 80, 80, 80 70, 70, 90, 100, and 150. Determine which number is the outlier. Use the dot plot to determine the mean, which is the balance point of the data value.

Part B
Direction: Make a dot plot for the data value 60, 60 80, 80, 80 70, 70, 90, 100, and 150. Remove the outlier and use the dot plot to determine the mean, which is the balance point of the data value. Compare your findings from part A with Part B and determine, which best represents the mean.

Session 2: Mode and Median

Motivational Moment: Play

The teacher will play a motivational video before the start of the formal lesson to inspire their students to work together. The teacher will explain that a few people working together will form a small group, which could lead to a large group working together. Many of our assignments may involve individual work, small group and large groups to complete a task, but together will reach the common goal or outcome.

*Material*s:
- PowerPoint Presentation
- Smartboard or Projector
- Pencil and notebook
- DOL: Worksheet
- Calculator

The information below the teacher informs students what they believe should go into their active notebook while teaching the lesson.

Standards:
- **6.SP.A.2** Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.

- **6.SP.A.3** Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

(Miles & Williams, 2016).

Objective:
- Student will be able to understand that data generated from statistical questions vary IOT understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.
- Student will be able to identify the differences between a statistical and no-statistical question IOT understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.
- The student will be able to recognize the responses to statistical questions have variations that can be to conclude the data set to recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

Essential Questions:
- How can you find the mode of a data set?

- How can you find the median value of a data set?

Interpretation (What do students need to know and be able to do?) of standard for this lesson plan:
- Understand that data collected to answer a statistical question can be analyzed by their distribution.
- Describe a set of data using its center (mean, **median, and mode**), spread (range), and overall shape.
- Create a line plot, histogram, dot graph, or box plot. (Miles & Williams, 2016).

Activity/Task

Warmup:
        Find the mean for each set of data:
        1. Data- 400, 600, 800
                Mean is 600
        2. Data- 1,000, 3,000, 5,000
                Mean is 300
        3. Data- 20,500, 70,250, 90,375
                Mean is 60,375
        Write two statistical questions
        Write one non-statistical question

Vocabulary:
Student will copy the vocabulary and their definitions into their notebook to use throughout this lesson.

- **Mode is the number the appears the most in a data set or graph. There can be more than one mode.**
- **Median is the middle number of a data set.**

Large/Small Group Instruction:
The teacher will provide instruction in a large group or flexible group setting. The teacher will provide time for students in their flexible groups and the teacher to discuss and present their answers to the class.

<div align="center">V & S Monthly Bowling Averages</div>

What is the mode for each data set?:

  Data: 10, 20, 20, 30, 40, 50, 60, 60, 70, 80, 80.
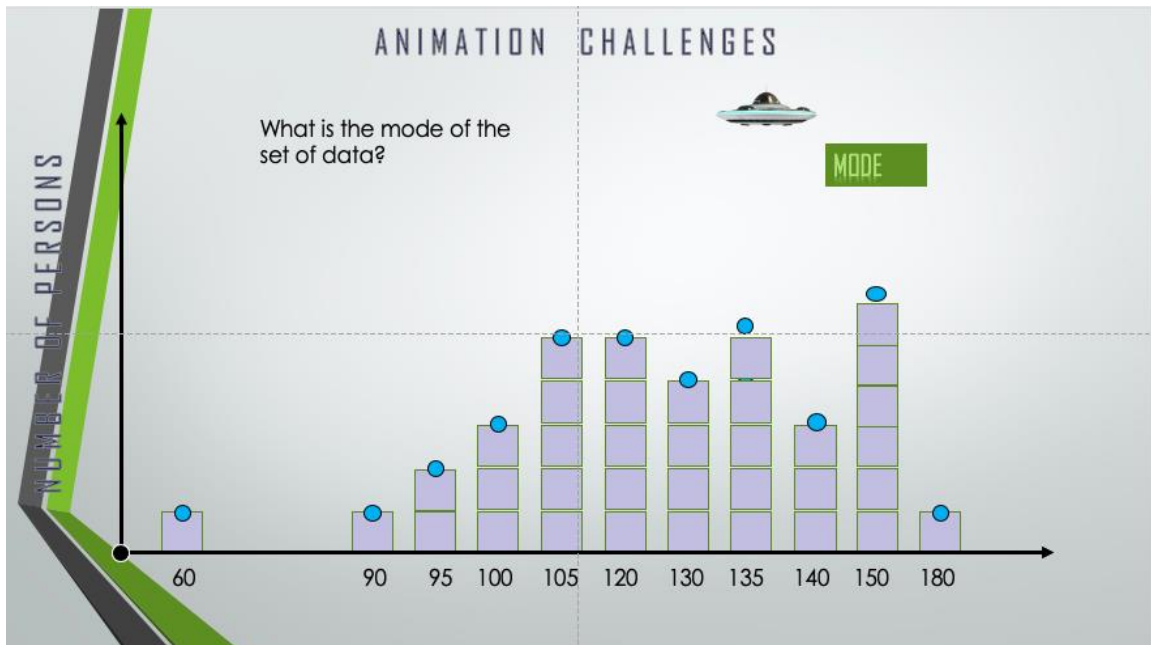
       The mode is 20, 60, and 80.

  Data: 100, 100, 200, 300, 400, 500, 500, 600, 700, 700, 800.
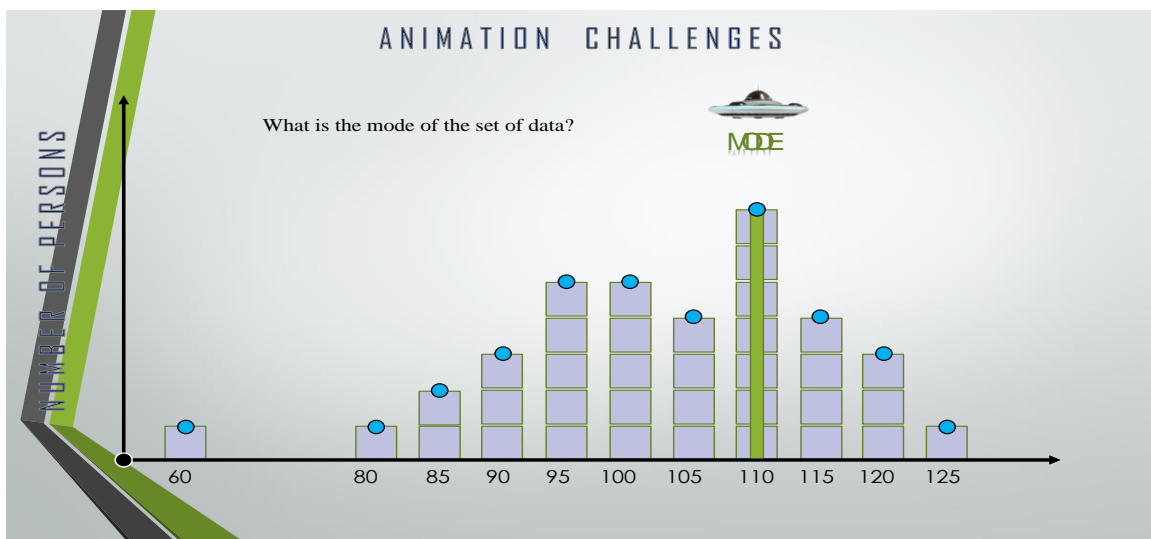
The mode is 100, 500 and 700.

Teacher and student will work together to complete the slide below:

What is the mode of the set of data?

Solution:

The mode of the data set is 110 because it appears the most.

Large/Small Group Instruction:
The teacher will provide instruction in a large group or small group setting. The teacher will provide time for students in their flexible groups and the teacher to discuss and present their answers to the class.

Differentiated Instruction
The teacher will use differentiated instruction to address flexible groups of students based on their ability to show and discussing the YouTube video below and working out a smaller section of the problems with their students.

https://www.youtube.com/watch?v=1jVZi0cNHls

https://www.youtube.com/watch?v=IHginNwss5c

What is the mode for each set of data?

- 40, 50 60, 50, 50, 30, 20, 10, 100

  Mode is 50

- 11.5, 12.75, 20.11, 12.75, 14.30

  Mode is 12.75

- 11, 22, 33, 55, 55,

  Mode is 55

- 12, 24, 36, 36,48, 48, 60, 72,72

  Mode is 36, 48 and 72

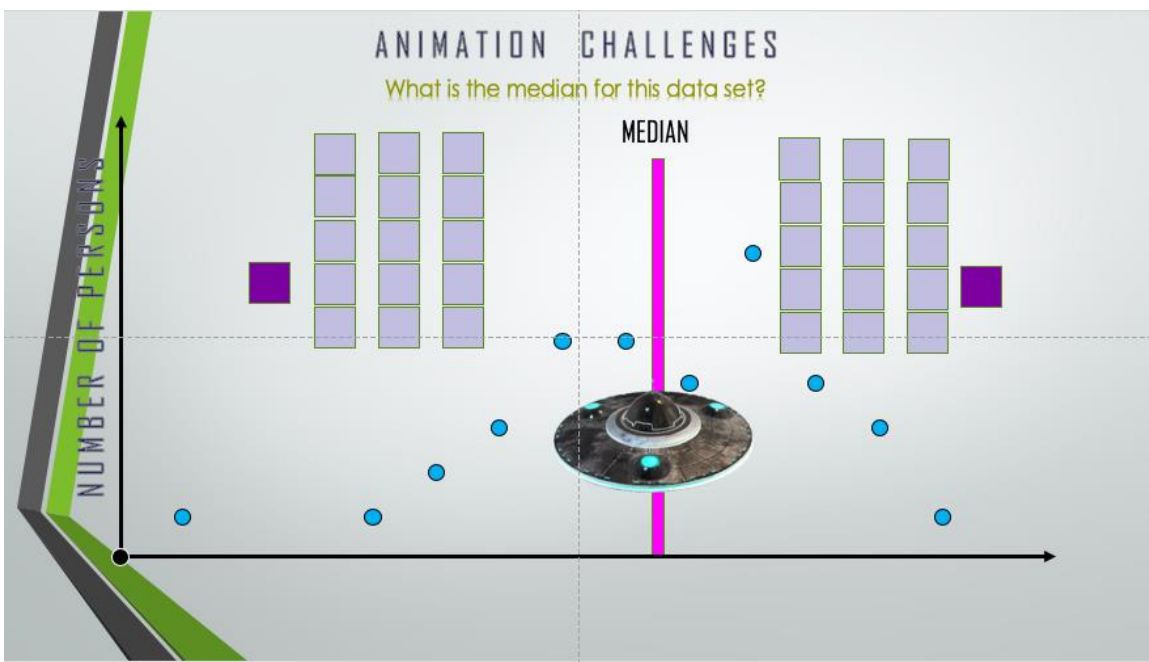- 20, 40, 60, 80, 80, 100, 120, 120

  Mode is 80 and 120

Teacher will state -What is the median for this data set? The teacher will provide groups time to solve the problem and present their solutions
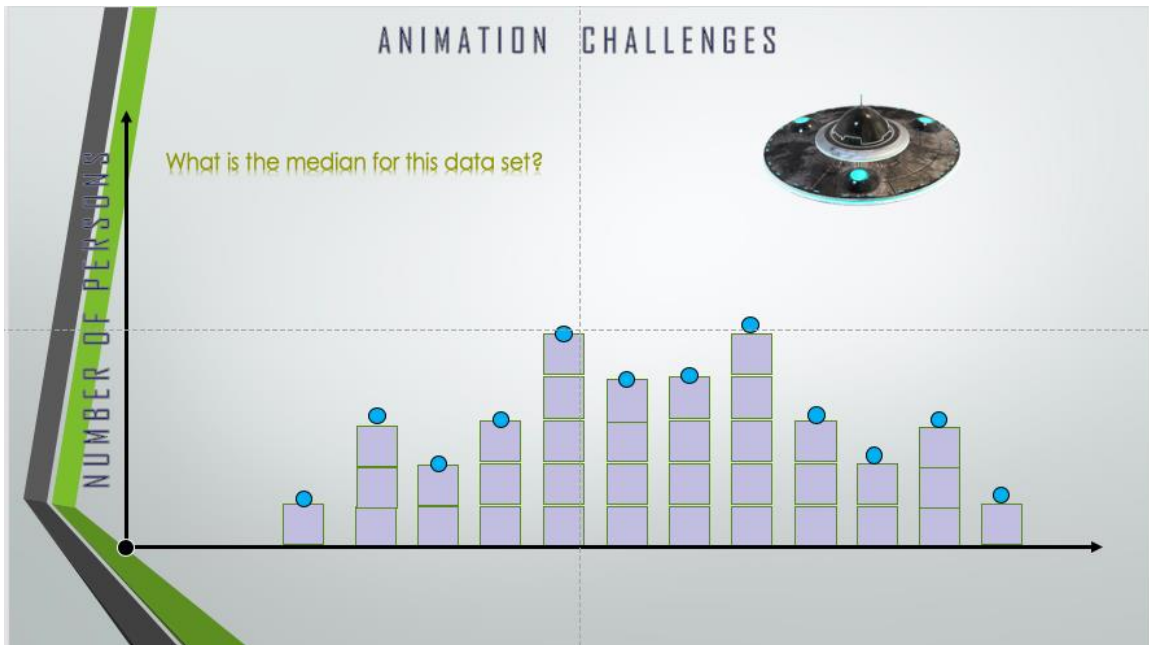
The teacher will explain that the data was split into two equal parts to provide a visual perspective of where the median maybe.

The teacher will show the final solution to confirm group responses.
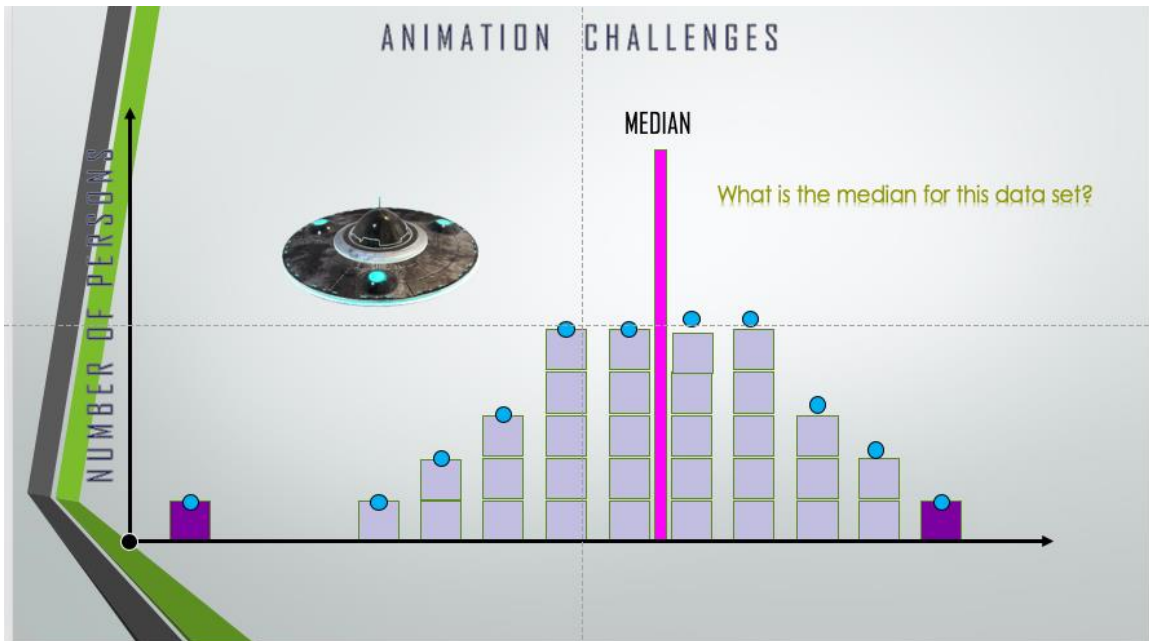
ANIMATION CHALLENGES

MEDIAN

What is the median for this data set?

NUMBER OF PERSONS

Demonstration of Learning:
Students will do the demonstration of learning activity independently. Demonstration of learning activity will be used as an assessment to show the student's mastery of the standards and objectives of the lesson.
Name: _____   Section_____

Demonstration of Learning

Part A:
Directions: Your team bowled the following scores:
700, 600, 600, 650, 800, 900, 400, 1,100.
What is the mode?
What is your median?
What is the mean?
What is the outlier
Draw a dot plot to show the data and answer the questions above. Then, explain whether the mode, median or mean is the best to represent the data.

Part B
Direction: Your team bowled the following scores:
	700, 600, 600, 650, 800, 900, 400, 1,100.
What is the mode?
What is your median?
What is the mean?
What is the outlier?
Draw a dot plot to show the data without the outlier. Then, explain whether the mode, median or mean is the best to represent the data with and without the outlier.

Session 3: The Best Measure of Center- Median VS Mean

Motivational Moment: Play

https://www.youtube.com/watch?v=sVPYIRF9RCQ&list=TLPQMjQwNDIwMjA2EMaU bbDo_A&index=5

The teacher will play a motivational video before the start of the formal lesson to inspire their students to work together. The teacher will explain that a few people working together will form a small group, which could lead to a large group working together. Many of our assignments may involve individual work, small group and large groups to complete a task, but together will reach the common goal or outcome.

*Material*s:
- PowerPoint Presentation
- Smartboard or Projector
- Pencil and notebook
- DOL: Worksheet
- Calculator

The information below the teacher informs students what they believe should go into their active notebook while teaching the lesson

Standards
- **6.SP.A.2** Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.

- **6.SP.A.3** Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.   (Miles & Williams, 2016)

Teacher inform students what they believe should go into their notebook while teaching the lesson

Interpretation (What do students need to know and be able to do?) of standard for this lesson plan:
- Describe a set of data using its center (**mean, median,** and mode), spread (range), and overall shape.
- Create a line plot, histogram, dot plot, or box plot.

(Miles & Williams, 2016)

Objective:
- Student will be able to understand that data generated from statistical questions vary IOT understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.
- The student will be able to recognize the responses to statistical questions have variations that can be to conclude the data set to recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

Essential Questions:
- How can you find the mean value of a data set?
- How can you describe an average of a data set other than the mean value of a data set?

Warmup:
Find the mean for each data set:
  Data: 12, 34, 60 ,70
      Mean is 44
   Data: 150, 250, 350, 450

Mean is 300

Data: 2,000, 4,000, 6,000, 8,000

Mean is 5,00

Vocabulary

- *Cluster is when the data is group together.*
- *Gap is when there is a separation between a group of data and another data point.*
- *Peak is the highest point in a set of data.*
- *Means is the value obtained by dividing the sum of several quantities by the number; an average*
- *Median is the middle number of a data set.*
- *Mode is the number the appears the most in a data set or graph. There can be more than one mode.*
- *Outlier is data that lies outside of the main group of data.*
- *Measure of Center is used to describe the value of a set of data*

Activity/Task

Activity 1:

Large/Small Group Instruction:

The teacher will provide instruction in a large group or small group setting. The teacher will provide time for students in their flexible groups to discuss and present their answers to the class.

What is the Median?   What is the mean?

Solution:

The median is 65.

The mean is 65

Jimmy League Bowling Averages

What is the Median?
The median is 65.

What is the mean?
The mean is 67.3.

NUMBER OF PERSONS

MEDIAN

2

1

50   60   70   100

SCORES   MEAN

Activity 2
Large/Small Group Instruction:
The teacher will provide instruction in a large group or small group setting. The teacher will provide time for students in their flexible groups to discuss and present their answers to the class.

Problem:
What is the mean, mode, gap, cluster, and peak?

Solution:

Students in their flexible groups and the teacher work together while the teacher may call upon individuals or group members to explain the answer below:

Problem

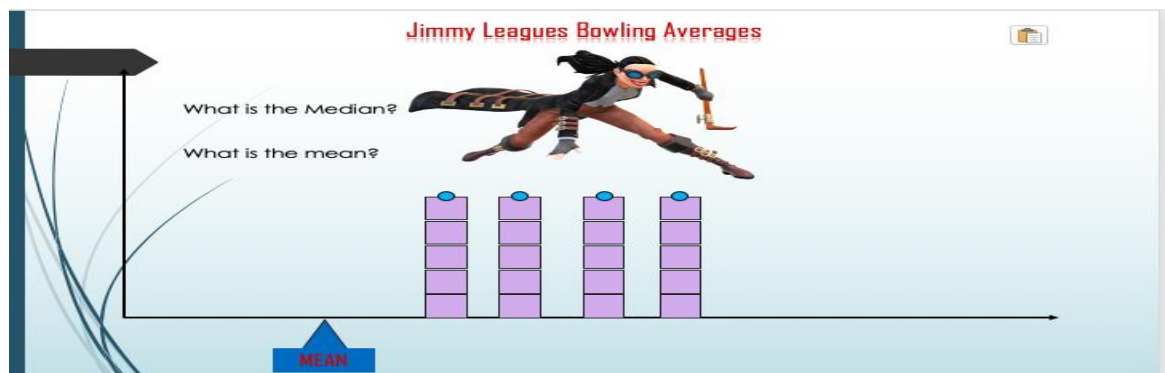*Activity 3*
Large/Small Group Instruction:
The teacher will provide instruction in a large group or small group setting. The teacher will provide time for students in their flexible groups to discuss and present their answers to the class.
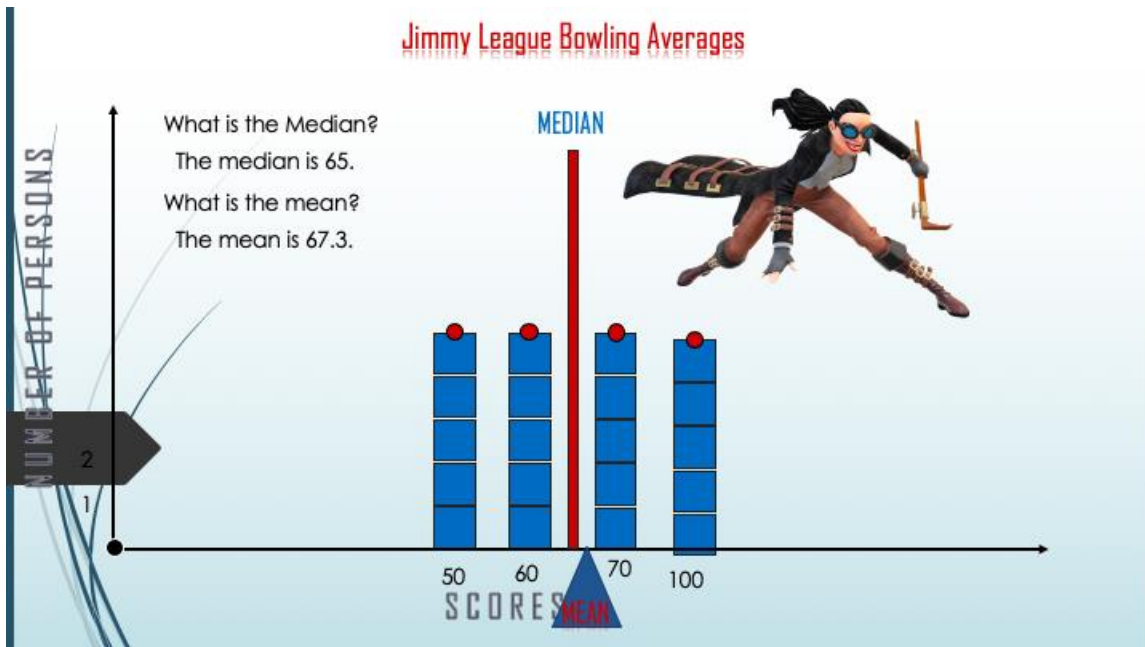
Differentiated Instruction
The teacher will use differentiated instruction to address flexible groups of students based on their ability to show and discussing the YouTube video below and working out a smaller section of the problems with their students.

https://www.youtube.com/watch?v=zSRs9iKAUW0
Discussion questions are What is the mean?, Where is the peak and cluster? Where is the gap? And What is the mode?

Solution:

The teacher will identify the gap.

The teacher will disclose the rest of the responses to their students.
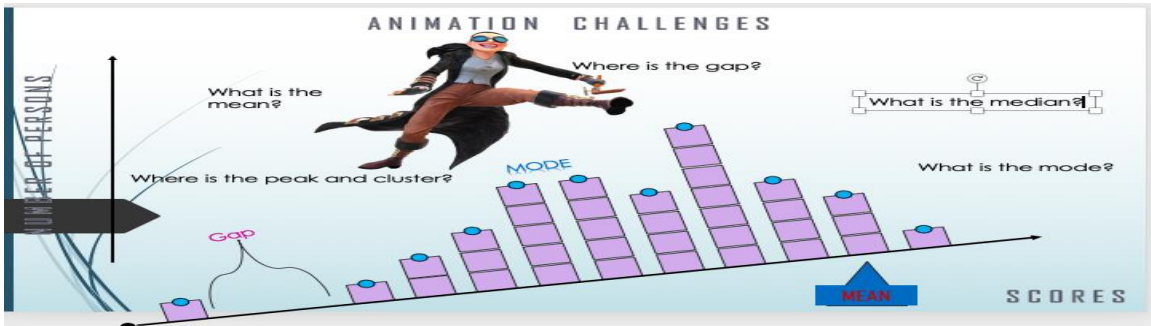
The teacher will explain the median is the best measure of center for this set of data.

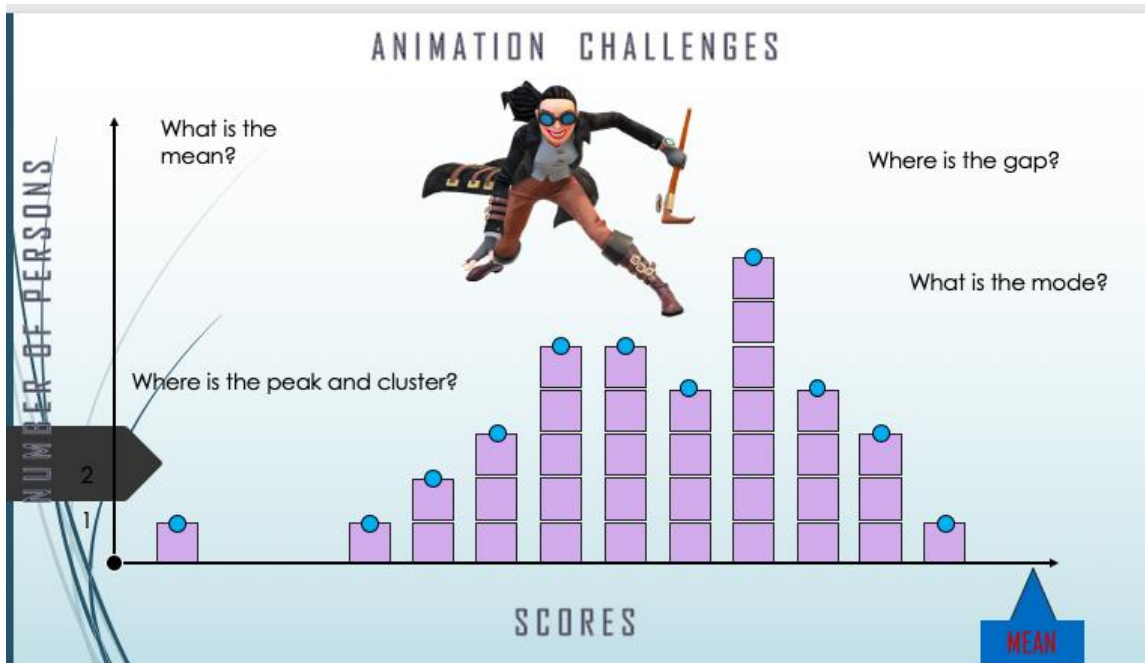*The Best Measure of Center is the median*
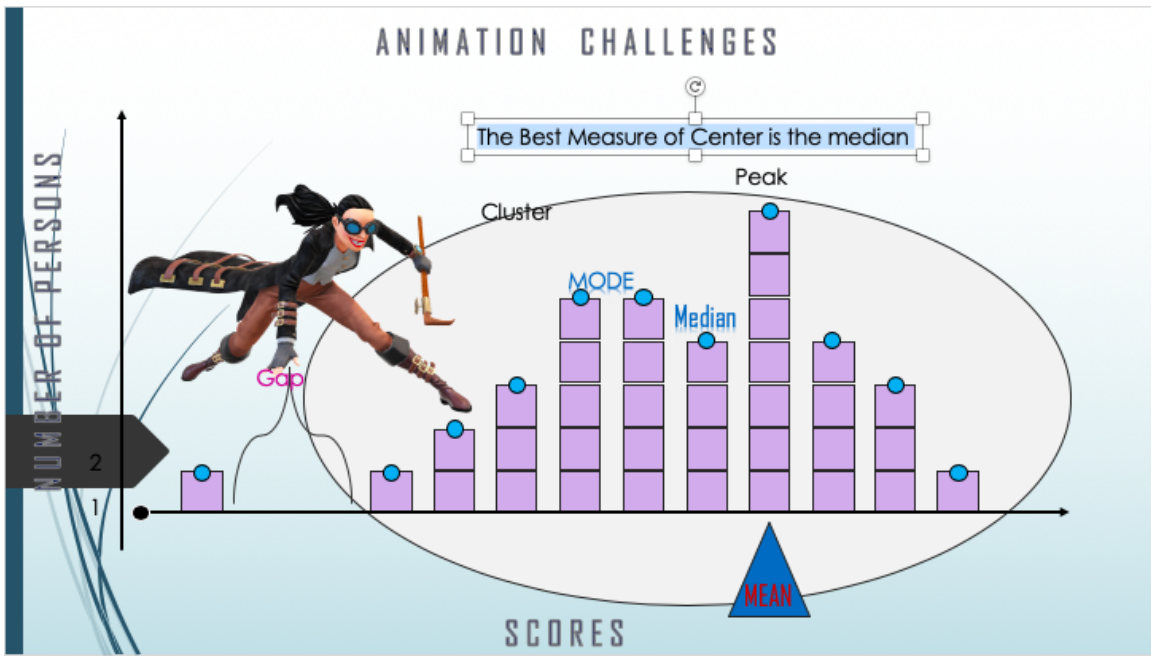
Large/Small Group Instruction:
The teacher will provide instruction in a large group or small group setting. The teacher will provide time for students in their flexible groups to discuss and present their answers to the class.

Jimmy's Juniors Youth Bowling League

Group Assignment

What is the Best Measure of Center

Your team bowled the following scores:

70, 60, 60, 65, 80, 90, 40, 210.

What is the mode?

What is your median?

What is the mean? Draw a dot plot too shows the data. Then, explain whether the mode,

median or mean is the best to represent the data.

Demonstration of Learning:
Students will do the demonstration of learning activity independently. Demonstration of
learning activity will be used as an assessment to show the student's mastery of the
standards and objectives of the lesson.

Name: _____   Section_____

Demonstration of Learning

Part A:
Team's bowled weekly scores:
700, 600,500, 500, 500, 800, 900, 100, 1,100.
What is the mode? Where is the Peak?
What is your median? Where does the data cluster?
What is the mean? Where is the gap?
What is the outlier?
Draw a dot plot to show the data. What is the best measure of the center? Then,
explain whether the mode, median or mean is the best to represent the data.

Demonstration of Learning
Part B
Team's bowled weekly scores:
        700, 600, 500, 500, 500, 800, 900, 100, 1,100.
                        What is the mode? Where is the Peak?
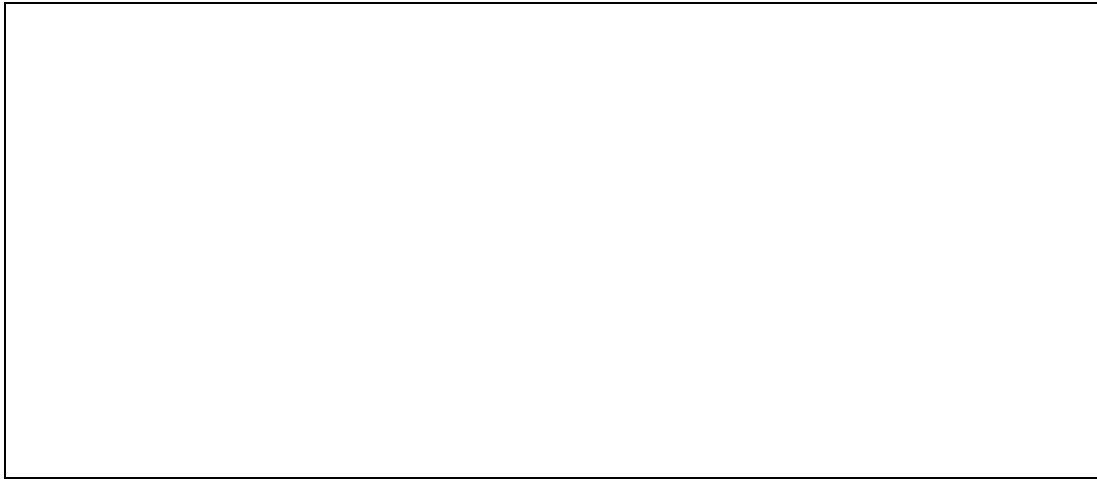   What is your median? Where does the data cluster?
                    What is the mean? Where is the gap?
                            What is the outlier?
Draw a dot plot to show the data without the outlier. What is the best measure of
    the center? Then, explain whether the mode, median or mean is the best to
                    represent the data with and without the outlier

Session 4: Measure Variation

Motivational Moment: Play

The teacher will play a motivational video before the start of the formal lesson to inspire their students to work together. The teacher will explain that each individual solves a problem in a way the answer suits them. There may come a time a person will solve a problem in a way it will benefit the mass. Many of our assignments may involve individual work, small group and large groups to complete a task, but together will reach the common goal or outcome.

*Material*s:
- PowerPoint Presentation
- Smartboard or Projector
- Pencil and notebook
- DOL: Worksheet
- Calculator

Teachers inform students standards should go into their notebook to review while teaching the lesson.

Standards
- **6.SP.A.2** Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.

- **6.SP.A.3** Recognize that a measure of center for a numerical data set summarizes

all of its values with a single number, while a measure of variation describes how its values vary with a single number.

(Miles & Williams, 2016).

Teachers inform students standards should go into their notebook to review while teaching the lesson.

Interpretation (What do students need to know and be able to do?) of standard for this lesson plan:
- Perform a statistical investigation, including the collection, organization, and analysis of the data.
- Analysis should include the appropriate statistics from mean, median, interquartile range, a measure of center, measure of variation, quartiles, lower quartiles, and upper quartile.

(Miles & Williams, 2016).

Objective:
- Student will be able to understand that data generated from statistical questions vary IOT understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.
- The student will be able to recognize the responses to statistical questions have variations that can be to conclude the data set to recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

Teachers inform students standards should go into their notebook to review while teaching the lesson.

Essential Questions:
- What is the best measure of the center of a data set?
- How would you use a measure of variation to describe a data set?

Vocabulary:

Student will copy the vocabulary and their definitions into their notebook
➢ Cluster is when the data is group together.
➢ Gap is when there is a separation between a group of data and another data point.
➢ Peak is the highest point in a set of data.
➢ Means is the value obtained by dividing the sum of several quantities by the number; an average
➢ Median is the middle number of a data set.
➢ Measure of Variation is used to describe the distribution of a set of data
➢ Mode is the number the appears the most in a data set or graph. There can be more than one mode.
➢ Outlier is data that lies outside of the main group of data.

➢ Range is the difference between the highest and lowest data points.
➢ Interquartile range is the range of the middle half of the data and is another measure of variation.
➢ Quartiles of a data set divide the data into four equal parts

Activity/Task
Students will be provided 5 minutes to complete independently. Students in their flexible groups will respond to the questions below.

Warm-Up
Find the mean, median, and mode (s) for the data below:

1. 70, 60, 50, 80, 70
2. 20, 10, 10, 20, 400
3. 100, 500, 100, 300, 400

Solutions:
   1. Mean 54, median 70 and mode 70
   2. Mean 24, median 20, mode 10
   3. Mean 280, median 300, and mode 100.

Differentiated Instruction
The teacher will use differentiated instruction to address flexible groups of students based on their ability to show and discussing the YouTube video below and working out a smaller section of the problems with their students.

https://www.youtube.com/watch?v=RMOmAn2ShR0

Activity 1
                    What is the interquartile range for the data?
          60   80   85   90   95   100   105   110   115   120   125

Students in their flexible groups and the teacher will work together to locate the median.

                                    Median
          60   80   85   90   95   (100)   105   110   115   120   125

Students in their flexible groups and the teacher will work together to locate the median for the lower half and upper half.
            Lower Half   Upper Half

60   80   (85)   90   95   100   105   110   (115) 120   125

The median of the lower half   The median of the upper half

Is the first quartile, Q1   Is the third quartile, Q3

    Q1 = 85   Q3 = 115

Students in their flexible groups and the teacher will subtract quartile 1 from quartile 3

Solution:

$$\text{Interquartile range (IQR)} = Q3 \quad - \; Q1$$

$$IQR = 115 \quad - \; 85$$

$$IQR = 30$$

Activity 2:

        What is the interquartile range for the data?

        Group Assignment

100   105   110   115   120   125   130   135   145   150   155

Students in their flexible groups and the teacher will work together to locate the median.

Median

100   105   110   115   120   (125)   130   135   145   150   155

Students in their flexible groups and the teacher will work together to locate the median
for the lower half and upper half.

    Lower Half   Upper Half

100   105   (110) 115   120   125   130   135   (145)   150   155

The median of the lower half   The median of the upper half

Is the first quartile, Q1   Is the third quartile, Q3

    Q1 = 110   Q3 = 145

Students in their flexible groups and the teacher will subtract quartile 1 from quartile 3

Solution:

$$\text{Interquartile range (IQR)} = Q3 - Q1$$
$$\text{IQR} = 145 - 110$$
$$\text{IQR} = 35$$

Demonstration of Learning:
Students will do the demonstration of learning activity independently. Demonstration of learning activity will be used as an assessment to show the student's mastery of the standards and objectives of the lesson.

Name: _____   Section_____

Demonstration of Learning

Part A:
Directions:
Your team bowled the following team scores the V & S Elmwood Lanes:
          900, 800, 700, 600, 600, 800, 900, 400, 1,100
What is the outlier, mode, median, mean, and peak?; Where is the gap, and where does the data cluster?; What is the best measure of center. Create a chart to display your response to the question.

Part B

Take the data from part a and determine the interquartile range. How would you use a measure of variation to describe the data set?
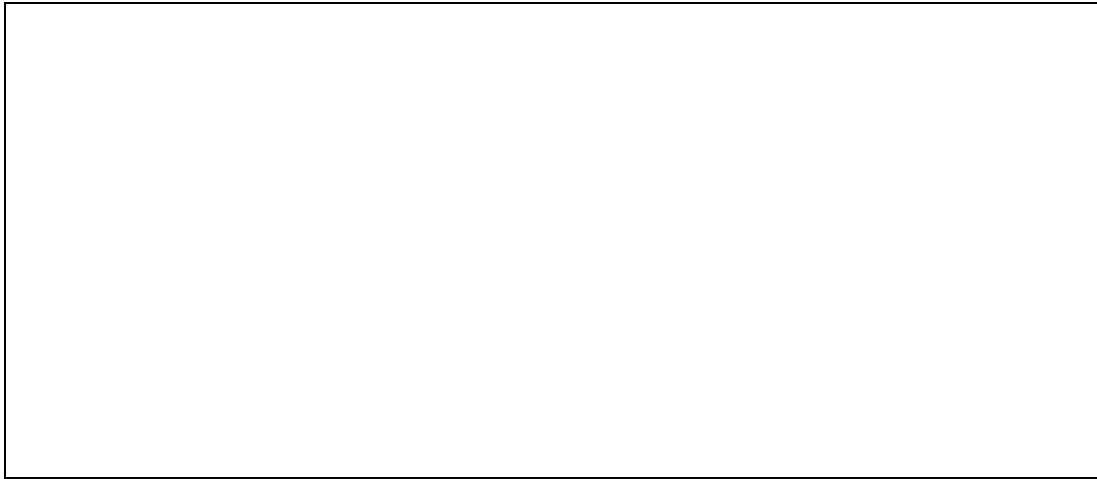
Resources
Annotated Bibliography for Teachers

Azman, F. N., Zaibon, S. B., & Shiratuddin, N. (2014). Exploring digital comics as an

      edutainment tool: an overview.

This article explores comics and graphic novels used in education. The usages of comics provide instructional content while discussing the technique used to incorporate learning across the curriculum. This book provides an explanation of illustrations and the writing of comics for the teaching and learning of the readers

Clark, H. & Avrith, A. (2017). The google infused classroom: A guidebook to making

      thinking Visible and amplifying student voice. Evaluatedbooksedu.com.

Clark & Avrith in their book infuse pedagogy in teaching with use of google classroom. The book expounds on why use Google in the classroom. The book explores and a section titled, "Disrupting what it means to be literate and provides Ten characteristics of our learners" for teachers to gleam additional information about the work they can do with google apps and their students. The book includes learning theories, ideas and formative assessments methods.

Keeler, A & (2018). Teaching math with google apps: 50 google suite activities. Dave

      Burgess Consulting, Inc. San Diego, Ca.

This book explores Google the learning management system to learning math easier in google. The book provides 50 activities for teachers to use in their classroom. The book provides means to provides teacher with ways to split paper into quarter sheet. The book provides teachers with a way to use slides in their classroom. Also, it provides teachers with the means to do small group investigation, etc.

Keeler, A & Miller, L. (2018) 50 Things you can do with google classroom. Dave

Burgess Consulting, Inc. San Diego, Ca.

This book explains over 50 ways to enhance student and teacher experience in with google classroom. The author of this book provides visual of google app being discussed to illustrate easy application of google classroom. The discussion surrounds teaching lessons, posting announcements, assignments to sharing of resources. The books discuss ways to provide parents with much needed information about their child's educational journey in the teacher's classroom. Also, this book goes further than 50 way to enhance the student and teacher experience in google classroom to offer additional resources to create a better digital learning.

Mc Cloud, S., (1993). Understanding the visual art comics. New York, New

York: HarperCollins.

This book provides the teacher with a chapter by chapter understanding of comics. The role of comics is explained in this book. The construction and purpose of comic storylines are expounded in this book.

Miles, R., & Williams, L., M (2016). The common core mathematics companion: The

standards decoded, grades 6-8: What they say, what they mean, how to teach them

Corwin mathematics.

This book provides educators with the common core math standards with a detailed discussion of does to teach the standard. The book provides a detailed explanation of what students should be doing to understand and apply the standard in a math class. The book highlight student misconceptions and errors when applying a math skill.

Walle, J. A., Jarp, K., & Bay-Williams, J. A., (2019). Elementary and middle school

mathematics: Teaching developmentally. New York, New York: Pearson.

In this book teachers will be able to learn how to teach math to their students and understand their thinking. This book guides a person through a lesson to effectively instruct a student on a particular skill or concept. It explores the development of children for the teacher to teach application and conceptual understanding of math skills.

Appendix
PA Core Standard:
CC.2.4.6.B.1 Demonstrate an understanding of statistical variability by displaying, analyzing, and summarizing distributions.
Common Core Clusters:
6.SP.A Develop understanding of statistical variability.
6.SP.B Summarize and describe distributions.
Content Standards:
CCSS.MATH.CONTENT.6.SP.A.1 Recognize a statistical question as one that anticipates the data related to the question and accounts for it in the answers. For example, "How old and/" is not a statistical question, but "how old are the students in my school? It is a statistical question because one anticipates variability in students' age.
CCSS.MATH.CONTENT.6.SP.A.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.
CCSS.MATH.CONTENT.6.SP.A.**3** Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.
CCSS.MATH.CONTENT.6.SP.B.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots.
CCSS.MATH.CONTENT.6.SP.B.5 Summarize numerical data sets concerning their context, such as by: a. Reporting the number of observations. b**.** Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. **c.** Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern regarding the context in which the data were gathered. **d**. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.