Lesson Title: Introductory Probability and Statistics

Unit Title: Introduction to Statistics

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Subject, Grade Level, and Date: Statistics, 10th grade, Feb, 4, 2010

Placement of Lesson in Sequence

This is the third lesson in a statistics learning progression.

Central Focus and Essential Questions

The central focus is for students to understand measures of central tendency, be able to represent this data on a box plot, and interpret the context of the data.

Content Standards

CCSS.Math.Content.HSS.ID.A.1: Represent data with plots on the real number line (dot plots, histograms, and box plots).

CCSS.Math.Content.HSS.ID.A.2: Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

CCSS.Math.Content.HSS.ID.A.1: Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers)

Learning Outcomes	Assessment
SWBAT: • **Determine the measures of central tendency given a set of data** • **Create a box-and-whisker plot given a set of data** • **Interpret data using proper terminology (measures of central tendency) and diagrams/box plots** • **recognize outliers within a set of data**	This formative assessment will be in the form of a survey which students will be conducting in order to collect data, plot it, and interpret it. The topic their group chooses for their survey must be quantitative and be approved by me (conceptual understanding). Students will then proceed to collect two sets of data one for the responses' of their female peers and another for their male peers responses'. Once students have collected their data they will need to determine the measures of central tendencies, the min, max, quartiles, and interquartile of their sets of data (Tukey's five number summary; Learning targets 1-3). This will allow me to assess their conceptual understanding and procedural fluency as students must understand what it is they are computing in order to do so. Using the information gathered they will create a box plot for each set of data and answer given prompts

	based off their collection of data (Learning targets 4-5). This will be assessing also procedural fluency as well as their reasoning skills as they conclude and explain answers. This activity allows students to be assessed through a hands on activity, making the activity a bit more appealing to students. Also to take some of the pressure off students will be working in groups. Allowing students to work in groups allows them to learn from one another so that it one group member doesn't understand another can help his understanding.

Learning Targets	Student Voice
1. **I can determine the measures of central tendency given a set of data** 2. **I can determine when it is best to use the median or the mean when describing the center of a set of data.** 3. **I can determine Tukey's five number summary given a set of data** 4. **I can use Tukey's five number summary to create a box-and-whisker plot** 5. **I can determine if a set of data contains any outliers**	The learning target will be on the board and discussed at the beginning of class and referred back to at the end of class. They will be asked to write down on a sheet of paper if they thought the lesson was effective in helping them meet their learning targets and if not explain why, what they learned, and what they found confusing (exit task). As students are working in groups throughout this activity, they will get a chance to discuss with their partner their thoughts and concerns. I will also be walking around the classroom checking for understanding giving students a chance to ask me questions and for me to address misconceptions.

Prior Content Knowledge and Pre-Assessment

Academic Language Demands		
Vocabulary & Symbols	**Language Functions**	**Precision, Syntax & Discourse**
• **Mode** • **median** • **mean** • **min** • **max** • **quartiles** • **interquartile range** • **range**	• Students can give the definition of the measures of central tendency and their use • Students will use proper terminology when interpreting their data • Students will need to distinguish their	**Mathematical Precision:** Students will communicate their findings using proper terminology using terms such as the spread, or the data is skewed to the left. Students must also realize which measure of central tendency can measure the center of a

• **measures of central tendency** • **quantitative** • **data spread** • **box-and-whisker plot** • **outliers** • **percentile** • **skewed**	difference between median and the mean and determine which one is appropriate to describe the "central" of a set of data	collection of data more accurately. **Syntax:** Students must be able to interpret data collected using proper terminology. **Discourse:** Students will discuss their findings with their groups in order to agree to a final answer for their prompts using proper vocabulary and reasoning. This will be encouraged by correcting students if inaccurate terminology is used and by using math language when speaking with students as well.

Language Target	Language Support	Assessment of Language Target
• **I can describe how I found each measure of central tendency** • **I can explain why either the median is more appropriately used to describe the central of a set of data rather than the mean or vice versa** • **I can interpret a set of data**	• Explain the definitions of all new terms and give examples of how they are used or determined • Give alternative explanations and examples to students that are having a difficult time grasping the concepts (conceptual understanding) • Be walking around the classroom to provide assistance to students who need it • One on one time with students with exceptionalities • Working in groups will allows students to also get help from their partner (cooperative learning).	I will be assessing their language targets through my observations of their discussions with their group members and reasoning of their answers. I will also assess this through their answers to their prompts, their collection of data, their list of central tendencies, and their box-and-whisker plots. I will be looking for usage of proper terminology in both the worksheet and through discussions with their peers as well as discussions between me and the student. These discussions will take place throughout the class.

Lesson Rationale (Connection to previous instruction and Objective Standards) Students were first introduced to the measures of central tendency and then Tukey's five number summary. They learned their definitions and how to compute them given a set of data. They also learned to interpret their data through these measures of central tendency and how although the mean and the median are both used to measure the center of a set of data, depending on the situation one can be more precise than the other. This allowed students to first understand the concepts before fully putting them to use. Students have also learned what outliers are, but in this lesson students will learn what the criterion is for an outlier and how to use the interquartile range to identify any outliers.

Differentiation, Cultural Responsiveness and/or Accommodation for Individual Differences

In order to accommodate for learning and achievement gaps amongst the students, they will get a chance to work in groups for this activity. They will be receiving feedback from their peers as well as from me. Feedback from both me and their peers/partner will allow students to gain a better conceptual understanding. This specifically benefits on of my students whose engagement level raises while working with groups, aiding her learning and procedural fluency. "Cooperative learning is the instructional use of small heterogeneous groups of students who work together to maximize their own and each other's learning" (Vaughan, 2002, p. 359). Cooperative learning especially benefits culturally diverse classrooms by allowing student to practice the new math language learned, through discussion with their peers.

Throughout the class period, I will be walking around to help those who need it. I will be providing alternative explanations to students who continue to be confused and address and correct misunderstandings students may have. I will be checking student's work and confirming their answers and/or steering them towards the answer. I will also checking that they are taking the proper steps. I will be asking them questions as I walk by to check their understanding and reasoning. I will also have some one on one time with students in need of extra helps. I will make sure that I leave a total of 10 minutes throughout the class period for my one on one time with the few students I have who often tend to need additional help to fully understand concepts. My next lesson plan will be based on how well they seem to understand today's lesson. For example, if they seem to be confused with the concepts my following lesson plan will be going over the same material and finding an alternative activity that may help the students better understand.

The assessment for this lesson is meant to keep students engaged and create a challenging environment in a fun matter. This will motivate struggling students to proceed and ask questions if they get stuck and promote deeper thinking for my more advanced students.

Students will turn in their work and will be assessed by the teacher (me). I will be examining their work and make note of any common misconception or patterns that I see as I grade these tasks. I will then be able to identify any common errors, aspects in which students are excelling at, and areas of improvement. I will then use this information to reteach what needs to be retaught through a different activity and

making changes to my instruction to help students better understand as well as create a more challenging environments to address the sections that students seem to excelling at.

Materials – Instructional and Technological Needs (attach worksheets used)

Students will need the worksheet given, writing utensil, and paper.

Teaching & Instructional Activities			
Time	**Teacher Activity**	**Student Activity**	**Purpose**
5 min	Elicit discussion on what we have learned about outliers and how they affect data distribution	Engage in class discussion. Take notes and ask questions.	See what students know about outliers
10 min	Give students a few practice problems	Work on practice problems	Give students a chance to practice finding outliers and ask questions regarding outliers
5 min	Give students their task	listen to directions and think of quantitative topic	Have students use their prior knowledge to conduct a survey and answer prompts
30min	observe and assess students	conduct survey/answer prompts	assess students understanding, procedural fluency, and reasoning skills.

Names:_____

Quantitative Topic:

	Females	Males
No. of observations		
Minimum		
Maximum		
1st Quartile		
Median		
3rd Quartile		
Mean		

1. Using the minimum, maximum, quartiles and median, sketch two side by side box plots to compare the data of your topic between the males and the females

2. How would you describe the difference in the data found between males and females? Be sure you discuss differences/similarities in shape, center and spread.

3. Is the mean greater or less than the median? Explain why.

4. Is the median or mean a more appropriate choice for describing the "centers" of these two distributions?