

**Topic: Dry Landing:
Airplane Statistics and Landing Input**

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Genre: Interdisciplinary
Grade Level: 6th grade

Unit: Statistical Data Collection
Estimated Duration: 1-2 single period

Essential Question

(Domain 1: Planning and Preparation-Component 1c: Designing Coherent Instruction)

- **How are measures of central tendencies utilized in the real world?**

Background Knowledge

Background Summary:

The unit studies physical properties of matter, energy transformations, as well as how energy is released or absorbed as light and as heat. This will provide a context for how weather conditions are produced in the atmosphere, and how weather events affect life in specific regions. Students may build tools to investigate weather in their local area, gathering and analyzing patterns and trends to describe weather conditions, make informed predictions, and explain hazardous weather conditions.

In this lesson students develop an understanding of statistical variability and apply that understanding as they summarize, describe, and display distributions. In particular, careful attention is given to measures of center and variability. Students will learn what mean, median, mode, and range are. The students will learn how to use this in a real set of data. They will also learn the importance and relevance of knowing these concepts.

Lesson Objective:

- Students will be able to understand different measures of central tendency.
- Students will be exposed to multiple ways of expressing a set of numbers.
- Student will be able to identify mean, median, mode and range.
- Students will understand that climate is the characteristic weather that prevails from season to season and year to year.

Standards

(Domain 1: Planning and Preparation- Component 1a: Demonstrating Knowledge of Content and Pedagogy)

NGSS Standards

MS-ESS2-6

Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns.

NYS Science Standards

2.2i Weather describes the conditions of the atmosphere at a given location for a short period of time.

Common Core Math 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.

CCSS.ELA-LITERACY.

Integration of Knowledge and Ideas:

RH.6-8.7 :Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.

Vocabulary (Domain I: Planning and Preparation - Component 1e: Demonstrating Knowledge of Students.)		Prep Work/Materials (Domain 1 Planning and Instruction- Component 1e: Designing Coherent Instruction, Domain 3 Instruction- Component 3c: Instruction Engaging Students in Learning)	Cross Curricular Connection (Domain I: Planning and Preparation - Component 1a: Demonstrating Knowledge of Content and Pedagogy, Component 1b: Demonstrating Knowledge of Students.)
mean average median mode range statistics data sample size standard deviation central tendency box plot	arid dry tropical desert climate weather temperature drought frequency runway	EV3 robot with ultrasonic sensor , touch sensor laptop/iPad with Mindstorms Education version tape/sticker (mark start point) article about MH370 flight	Science Mathematics Social Studies/Literacy Technology Engineering
Differentiation (Domain I Planning and Preparation-Component 1e: Designing Coherent Instruction, Domain 3: Instruction - Component 3b: Using Question and Discussion techniques Domain 3: Instruction - Component 3c: Engaging Students in Learning)			

- Bodily kinesthetic learners - Airplane Dry Landing Auto and Manual Hands on Activities
- Audio and Visual learners – Visual representation of activity in the Do Now. The observations collected throughout the activity. Brainpop.com video clip on climate. Reading the article about the MH370 flight.
- ELL/Low reader - Guided notes printed for those who require them
- Technology- Utilizing Lego Mindstorms robot kit and digital program
- Enrichment: Compare data from auto and manual experimental trials
- Extended time for those who require it
- Small groups
- Individual attention from ICT teachers and paraprofessionals
- Resource room remediation for those who require

Procedure (Domain I Planning and Preparation-Component 1e: Designing Coherent Instruction, Domain 3: Instruction - Component 3b: Using Question and Discussion techniques Domain 3: Instruction - Component 3c: Engaging Students in Learning)	Student Engagement (Teacher Assessment)
<p>1) Introduce the problem of the day Airlines sometimes have trouble landing their planes properly on the runways. This is especially the case because their planes fly into both tropical areas with wet runways (like far Northern Australia) and hot dry areas (like LAX). You have been hired as an engineer and mathematician to explore this climate effect, and also to see if it would be better to install an automatic braking system on the plane once it hits the runway.</p> <p>2) Do Now: Reviewing climate vocabulary, basic organization of numbers, <i>Reference: Statistics Airplane Landing Dry Landings Worksheet</i> 2a) Watch quick video reviewing vocabulary terms https://www.brainpop.com/science/weatherandclimate/climate/types/preview.weml</p> <p>3) Have students find connections between today's problem and real world articles about past problems with aircraft landings.. (NOTE: Previous homework assignment- read article about JetBlue landing gear failures and watch video) http://content.time.com/time/nation/article/0,8599,1107825,00.html http://www.maniacworld.com/JetBlue-Emergency-Landing.htm</p> <p>4) Mini Lesson/Review - Calculating Central Tendency. Why do we collect data and assess it using mean, median, mode and range. Provide students with knowledge on how and why statistics is relevant in our everyday world. Provide step by step directions for calculating mean, median, mode, and range.</p> <p>5) Demonstrate how to hold sensor while running Dry Manual Landing Program. Record your data on board. Have one student from each group use the sensor on your demo robot. Record their data.</p> <p>6) In small groups, direct students to conduct experiment and record data on worksheet as well as on an Excel spreadsheet by</p>	

<p>utilizing Student Data Collection Directions.</p> <p>7) Circulate and motivate students to start their data collection. Asking students key questions as well as to describe what they are observing, and documenting data on worksheet.</p> <p>8) In small groups, direct students to conduct the Dry Automatic Landing Program experiment and record data on worksheet as well as on an Excel spreadsheet by utilizing Student Data Collection Directions.</p> <p>9) Have group members document observations made about their data on a class discussion board.</p> <p>10) Extension: Students will represent their data in multiple ways (box plot and stem and leaf plot)</p> <p>Student Data Collection Directions:</p> <ol style="list-style-type: none"> 1. Connect your touch sensor to your robot with the longest wire into Port 2. 2. Connect your Ultrasonic Sensor to Port 1 3. Load Statistics Airplane Landing Program on EV3. 4. Mark a starting point on ground approximately 5ft from wall 5. Have each member of the group run the Dry Manual program holding the sensor down for 3 secs <p>(Note: Students will have varying measurements of 3 secs.)</p> <ol style="list-style-type: none"> 6. Record the values on screen on Statistics Airplane Landing Dry Worksheet. 7. Run the Dry Auto Landing Program. 8. Record the values on screen on Statistics Airplane Landing Dry Worksheet. 	
<p>Assessment (<i>Formative or Summative</i>) (Domain 1 Planning and Instruction- Component 1e: Designing Coherent Instruction, Domain 3 Instruction- Component 3c: Engaging Students in Learning, Domain 3 Instruction- Component 3d: Using Assessment in Instruction)</p>	<p>Student Engagement (Teacher Assessment)</p>

<p>Pre-assessment: (Do Now)</p> <p>Assessment will occur during lesson and after the lesson, by gauging understanding and mastery through student responses to lesson discussion as well as their answers to the in class activity worksheets. We will wrap up by answering the objectives; reviewing in class worksheets, and having the students summarize the lesson activity.</p> <p>KEY Questions:</p> <p>Which measure of central tendency is most useful to the airplane designers?</p> <p>If you ran a series of tests, how would you compare the data? What statistical calculations might be useful in this case?</p> <p>After collecting your data from the dry auto and the dry manual trials, what forms of human error could have caused the variation in data?</p>	
Additional Resources	