Tactical Urbanism: Pop-Up Data Crunch

Subject Areas: Science & Technology, Problem Solving, Data Analysis & Probability

Associated Unit: Tactical Urbanism – Pop-Up Street Projects

Lesson Title: Pop-Up Data Crunch

Header

Image 3-A

Image file: http://wrtwc.org/wp-content/uploads/2020/02/Student_Using_Radar-1.jpg

ADA Description: Student crouched behind a parked vehicle using a radar gun on an urban street.

Source/Rights: bill.becker@ronank12.edu

Caption: Student Collecting Speed Data Via Radar Gun

Grade Level: Middle School (6th – 8th)

Lesson # 3 of 3

Lesson Dependency : The following interconnected lessons can be used independently or as a series:

(1 of 3) Tactical Urbanism: Pop-Up Projects

(2 of 3) Tactical Urbanism: Mock-Up Pop-Up

(3 of 3) Tactical Urbanism: Pop-Up Data Crunch (This Lesson)

Time Required: 45-60 minutes

Summary: Students will collect before and after speed data in an interested area (or use the data set provided). Students will analyze the data to make a determination about the effectiveness of the traffic calming strategy utilized.

Engineering Connection: Tactical urbanism is a city and/or citizen-led approach to neighborhood using short-term, low-lost and scalable interventions to catalyze long term change. City engineers may use these temporary approaches to traffic calming before commiting to more costly, permanent approaches. Like city engineers, students will be expected to analyze sets of traffic data from before and after specific interventions to make a determination about the effectiveness of the design.

Engineering Category: Engineering design process

Keywords: Tactical Urbanism, Pop Up Street Projects, Data Analysis, Boxplots, Box & Whisker

Educational Standards

State STEM Standards

Montana K-12 Science Standards – Standard 5
Description: Students, through the inquiry process, understand how scientific knowledge and technological developments impact communities, cultures and societies.
Education Level: Grades K – 12
Subject: Science

National Council of Teachers of Mathematics - Data Analysis and Probability
Description: Select and use appropriate statistical methods to analyze data.
Education Level: Grades Pre-Kindergarten - 12
Subject: Math

International Technology and Engineering Educator Association (ITEEA) Standards

Standards for Technological Literacy: Content for the Study of Technology – The Designed World 18
Description: Students will develop an understanding of and be able to select and use transportation technologies.
Education Level: Grades K – 12
Subject: Technology

Next Generation Science Standards (NGSS)

Engineering Design: MS-ETS1-3
Description: Students who demonstrate understanding can: Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
Education Level: Grades 6 – 8
Subject: Science

Common Core State Standards (CCSS)

Statement Notation: CCSS.Math.Practice.MP1
Alt. Statement Notation: MP.1
Description: Standards for Mathematical Practice – Standard 1
Make sense of problems and persevere in solving them.
Education Level: Grades K – 12

Subject: Math
Statement Notation: CCSS.Math.Content.6.SP.B
Cluster: Statistics and Probability
Strand: Summarize and describe distributions.
Education Level: Grade 6
Subject: Math

Statement Notation: CCSS.Math.Content.7.SP.B
Cluster: Statistics and Probability
Strand: Draw informal comparative inferences about two populations.
Education Level: Grade 7
Subject: Math

Pre-Requisite Knowledge
Students should have a basic understand of how to calculate measures of central tendency including mean, median, mode, range, inner quartile range and five-number-summary. Students should also know how to construct boxplots for given sets of data.

Learning Objectives
After this lesson, students should be able to:

- Comparatively analyze data sets of before and after intervention traffic speed data through the use of boxplots.
- Argue the effectiveness of specific intervention using an analysis of sets of before and after intervention traffic speed data.
- Write a statistics based letter of recommendation for future continuance of the intervention used to a concerned party.

Introduction / Motivation
Summary statistics are an important part of determining the effectiveness of any intervention. While the mean, median and mode are all commonly used, a single number often doesn't tell the whole story. Boxplots are a tool that can give a more complete picture about the spread of a set of statistics as well as a more accurate visual of how multiple sets of data compare.

Lesson Background & Concepts for Teachers
This lesson is intended as a follow up for box and whisker plots (students should already know how to construct them). The focus is on the application of boxplots as a tool for comparative analysis as well as one method for obtaining the needed values (5-number summary) for large sets of data using Microsoft Excel.

This can be done as an activity where the data is gathered but the associated activities listed will use the data obtained as part of the Lindley Park Speed Reduction Project in Bozeman, MT.

Image

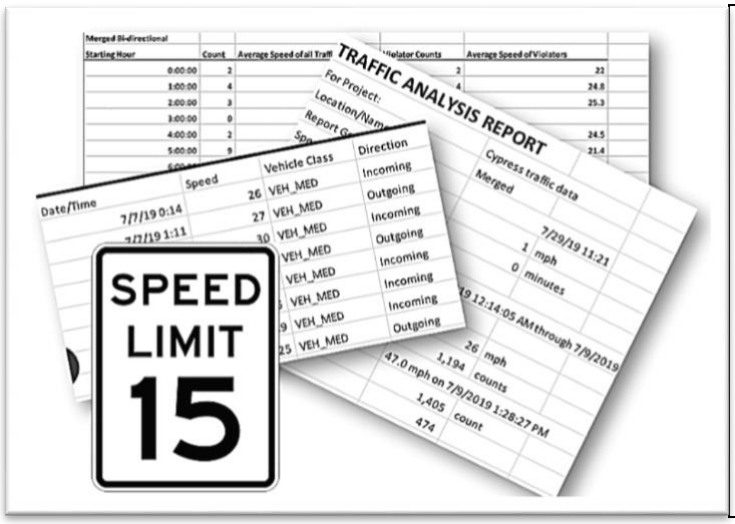

Figure 3-B

Image file: http://wrtwc.org/wp-content/uploads/2020/02/Pop_Up_Data_Picture-1.png

ADA Description: Traffic report summary statistics shown along with a 15mph speed limit sign.

Source/Rights: bill.becker@ronank12.edu

Caption: Traffic Speed Reports

Vocabulary / Definitions

Word	Definition
Tactical Urbanism	A city and/or citizen-led approach to neighborhood using short-term, low-lost and scalable interventions to catalyze long term change.
Traffic Calming	A full range of methods to slow cars, but not necessarily ban them, as they move through commercial and residential neighborhoods.
Traffic Circle	A road junction at which traffic moves in one direction round a central island to reach one of the roads converging on it.
Curb Extension	Used to extend the sidewalk, reducing the crossing distance and allowing pedestrians about to cross and approaching vehicle drivers to see each other when vehicles parked in a parking lane would otherwise block visibility.
Pedestrian Crossing	(aka: crosswalk) A marked part of a road where pedestrians have right of way to cross.
Creative Use of Space	Reimagining of excess roadway space or space next to roadways in an effort to increase functionality of that space, increase the visibility of pedestrians and reduce the speed of vehicle travel.
Dedicated Bike Path	A pathway separated from motorized traffic and dedicated to cycling or shared with pedestrians or other non-motorized users.

Associated Activities

1) Give the Pre-Assessment, BONE LENGTH WORKSHEET, as a review on how to construct boxplots as well as to determine how well students can interpret them.
2) If a review of boxplot construction is needed, here is a good website: CONSTRUCTING BOX AND WHISKERPLOTS WEBPAGE.
3) Post-Introduction Assessment via a class discussion on how to compare boxplots. Here is a good resource if needed. COMPARING BOXPLOTS WEBPAGE
4) The LINDLEY PARK SPEED DATA (link will download Excel spreadsheet)[1] provided was obtained during the Lindley Park Speed Reduction Project in Bozeman, MT. In this project, two traffic circles were installed at intersections located along an area of concern. LINDLEY PARK SPEED DATA was collected for two 3-day period (Sun/Mon/Tues of consecutive weeks). Tab 1 contains the data from **before** the traffic circles were installed. Tab 2 contains the data from **after** the traffic circles were installed.
5) The LINDLEY PARK SPEED DATA provided has over 1200 pieces of data in each set. The EXCEL CENTRAL TENDANCIES INSTRUCTION SHEET activity explains how to obtain those values so that boxplots can be created and analyzed.
6) Have students plot boxplots for the Before Intervention and After Intervention data on the same number line. Students are to write down any observations they may have.

Lesson Closure

[1] The "Lindley Park Speed Data" cited throughout this lesson plan is the same spreadsheet. While the link is provided whenever it is mentioned, it is only necessary to download it once.

7) Discuss any observations made by students as to the difference in the boxplots and the effectiveness of the Traffic Calming Intervention

Assessment

Pre-Lesson Assessment
BONE LENGTH WORKSHEET

Post-Introduction Assessment
COMPARING BOXPLOTS WEBPAGE

Lesson Summary Assessment
Comparative analysis of Before Intervention and After Intervention boxplots.

Homework
CENTRAL TENDANCIES ASSESSMENT (STUDENT VERSION)

CENTRAL TENDANCIES ASSESSMENT (TEACHER VERSION)

Lesson Extension Activities

Have students continue to use Excel to find other summary statistics.

Have students apply these methods to other sets of large data.

Additional Multimedia Support

NEWSPAPER ARTICLE ON TRAFFIC CALMING ART IN BOZEMAN

NEWS STATION SEGMENT ON BOZEMAN ART INSTALLATIONS

References

STATISTICS CANADA WEBPAGE ON CONSTRUCTING BOX AND WHISKERS PLOTS

Attachments

LINDLEY PARK SPEED DATA

LINDLEY PARK DATA GRAPHICS – SAMPLE BOX PLOTS AND COMPARATIVE DATA

EXCEL CENTRAL TENDANCIES INSTRUCTION SHEET

Other

N/A

Redirect URL
N/A

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Classroom Testing Information
This curriculum was tested with a summer camp consisting of 20 students (grades 6, 7 & 8) on July 25, 2019 at Montana State University in Bozeman, Montana.