Lesson Plan

Grade: 6th    Subject: Math    Topic: Data Analysis through Computer Science

Lesson Focus & Goals

The focus of this lesson is to introduce students to the concept of exploring wildlife-vehicle collisions through computer science. The primary goals include:

1. Understanding the significance of wildlife crossings in reducing wildlife-vehicle collisions.
2. Learning how to analyze data related to animal-vehicle collisions using programming and data visualization techniques.
3. Developing critical thinking skills in interpreting data patterns and making data-informed decisions regarding wildlife conservation and road safety.

Materials

- Computers with internet access and Pyret programming environment (provided).
- Animal-vehicle collision dataset (provided).
- Handouts or access to online resources for reference materials.
- Pencil and paper for note-taking and activities.

Objectives

By the end of the lesson, students should be able to:
1. Utilize programming tools to create various types of charts (bar charts, pie charts, scatter plots) in Pyret.
2. Analyze data patterns, outliers, and trends in animal-vehicle collision datasets.
3. Apply proportional reasoning to make predictions based on the data.
4. Interpret scatter plots and calculate rates of change.
5. Propose data-informed interventions to address wildlife-vehicle collisions.
6. Identify additional factors influencing wildlife-vehicle collisions and suggest further data collection and analysis.

Activities

Day 1 - Part 1: Launch - Wildlife Crossings Save Lives!
Part 2: Introducing the Data Set: Animal-Vehicle Collisions in Vermont - Notice & Wonder
Part 3: Introducing the Pyret Programming Environment - Bar Chart / Pie Chart
Part 4: Scatter Plots, Outliers & Human Error

Day 2 - Part 5: More Pie Charts & Bar Charts
Part 6: Comparing Subsets / Making Predictions Using Proportional Reasoning
Part 7: Patterns in the Code - More Subsets & Pie Charts via Filtering
Part 8: Analyzing Scatter Plots Using Rate of Change
Part 9: Data-Informed Decision Making
Part 10: Beyond the Data Set - Making Connections - What else might we want to know?

Assessment

Formative and summative assessments will be integrated throughout the lesson to gauge student understanding and progress. Assessment methods include:
1. Classroom Participation: Observations of student engagement, participation in discussions, and completion of activities.
2. In-Class Exercises: Assessing students' ability to create charts, analyze data, and answer questions during hands-on activities.
3. Project Work: Assessment of students' final projects, where they propose interventions based on data analysis and present their findings.
4. Reflections: Written reflections or discussions where students articulate their learning, insights gained, and areas for further exploration.
Data Analysis through Computer Science

First Period (45 minutes)

Lesson Overview

Part 1: Launch - Wildlife Crossings Save Lives!
- Start with a discussion on the importance of wildlife crossings in reducing wildlife-vehicle collisions.
- Introduce the concept of using computer science to analyze data related to wildlife-vehicle collisions.

Part 2: Introducing the Data Set: Animal-Vehicle Collisions in Vermont - Notice & Wonder
- Present the dataset on animal-vehicle collisions in Vermont.
- Engage students in a "Notice & Wonder" activity where they explore the dataset and discuss what they notice and what questions they have about the data.

Materials
- Computers with internet access and Pyret programming environment (provided).
- Animal-vehicle collision dataset (provided).
- Handouts or access to online resources for reference materials.
- Pencil and paper for note-taking and activities.

Targeted TEKS and Objectives Overview

Objective 1:
- (6.12A) Measurement and data. The student applies mathematical process standards to use numerical or graphical representations to analyze problems.

Objective 2:
- (6.13B) Measurement and data. The student applies mathematical process standards to use numerical or graphical representations to solve problems.

Objective 3:
- (8.11) Measurement and data. The student applies mathematical process standards to use statistical procedures to describe data.

Second Period (45 minutes)

Lesson Overview

Part 3: Introducing the Pyret Programming Environment - Bar Chart / Pie Chart
- Provide an overview of the Pyret programming environment.
- Demonstrate how to create basic bar charts and pie charts using Pyret.
- Have students practice creating their own charts using the animal-vehicle collision dataset.

Part 4: Scatter Plots, Outliers & Human Error
- Introduce scatter plots and discuss how they can reveal patterns and outliers in data.
- Guide students through identifying outliers and potential human errors in the dataset using scatter plots.
- Discuss the importance of data cleaning and validation.

Materials
- Computers with internet access and Pyret programming environment (provided).
- Animal-vehicle collision dataset (provided).
- Handouts or access to online resources for reference materials.
- Pencil and paper for note-taking and activities.

Targeted TEKS and Objectives

Objective 1:
- (6.12A) Represent numeric data graphically, including dot plots, stem-and-leaf plots, histograms, and box plots.
- (6.12B) Use the graphical representation of numeric data to describe the center, spread, and shape of the data distribution.

Objective 2:
- (6.13B) Interpret numeric data summarized in dot plots, stem-and-leaf plots, histograms, and box plots.

Objective 1:
- (8.11) Construct a scatterplot and describe the observed data to address questions of association such as linear, non-linear, and no association between bivariate data.
Data Analysis through Computer Science

Third Period (45 minutes)

Lesson Overview

Part 5: More Pie Charts & Bar Charts
- Review creating pie charts and bar charts in Pyret.
- Have students create more complex charts to explore different aspects of the animal-vehicle collision data.

Part 6: Comparing Subsets / Making Predictions Using Proportional Reasoning
- Teach students how to compare subsets of data and make predictions using proportional reasoning.
- Have students analyze subsets of the dataset and make predictions about future trends in wildlife-vehicle collisions.

Part 7: Patterns in the Code - More Subsets & Pie Charts via Filtering
- Introduce filtering techniques to extract specific subsets of data.
- Guide students through creating more subsets and pie charts based on filtered data.
- Encourage students to identify and analyze patterns in the filtered data.

Lesson Overview

Part 8: Analyzing Scatter Plots Using Rate of Change
- Teach students how to analyze scatter plots using rate of change.
- Have students calculate and interpret rates of change in the animal-vehicle collision data.
- Discuss the implications of these rates of change on wildlife conservation efforts.

Part 9: Data-Informed Decision Making
- Engage students in a discussion on how data from the animal-vehicle collision dataset can inform decision-making processes related to wildlife conservation and road safety.
- Have students propose and justify potential interventions based on the data analysis.

Part 10: Beyond the Data Set - Making Connections - What else might we want to know?
- Prompt students to think about other factors that may influence wildlife-vehicle collisions.
- Encourage students to brainstorm additional data they would like to collect and analyze to gain a deeper understanding of the issue.
- Discuss the importance of interdisciplinary approaches to addressing complex problems like wildlife-vehicle collisions.

Materials
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- Animal-vehicle collision dataset (provided).
- Handouts or access to online resources for reference materials.
- Pencil and paper for note-taking and activities.

Targeted TEKS and Objectives

Objective 1:
- (6.12A) Represent numeric data graphically, including dot plots, stem-and-leaf plots, histograms, and box plots.

Objective 2:
- (6.12B) Use the graphical representation of numeric data to describe the center, spread, and shape of the data distribution.

Objective 3:
- (6.12A) Interpret numeric data summarized in dot plots, stem-and-leaf plots, histograms, and box plots.

Objective 3:
- (8.11A) Construct a scatterplot and describe the observed data to address questions of association such as linear, non-linear, and no association between bivariate data.