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Lesson Plans

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INTRODUCTION

Introduction 1 - Curriculum Introduction

In the introductory lesson for the Computer Science course, we aim to familiarize students with the curriculum by module and pique their interest in data mining within a social media context. We will initiate the lesson with a discussion centered around students' interests, such as video games and K-pop, to encourage engagement. Following the discussion, we will present a multimedia lecture where students will be expected to take notes. The core vocabulary to be covered includes boxplot, Twitter, hashtags, visualization, and data normalization, along with additional terms such as developer account, mining, API, access token, authentication token, libraries, tweepy, and pandas. To support lesson differentiation, students will be onboarded on data gathering within a social media context. They will be guided step-by-step in creating a developer account and provided with a hands-on walkthrough to extract data from Twitter using code. To assess students' comprehension, we will present an exit ticket question focused on potential data mining topics in the realm of social media. This will enable us to gauge their understanding and make any necessary adjustments to the teaching approach.

Teacher	**Course**	**Lesson Date**	**Lesson**
Sandy Marie Romo	**Computer Science**	**Day 1**	**Curriculum Introduction**

Board Configuration	
Aims	**Students will gain the following skills:**
A:	Understand the curriculum by module

Objective	**Essential Question**
Students will be able to learn more about the curriculum of the program.	How can we extract data from Twitter?

Lesson Agenda			
Agenda/Time	**5 E's**	**Learning Activities**	
		Teacher will…	**Students will …**
1	Engage (Quick Start/ Discuss)	Teacher will post questions on board and facilitate discussion highlighting [answer].	What is data mining and how can it be used to investigate topics you enjoy reading about on the internet? **Answer**: The extraction and pattern identification of data sets; it can be used to explore public consensus on video games, k-pop, etc.
2	Explain (Guided Practice)	Lecture with multimedia slides. 1. Curriculum Introduction.pptx	Students will take notes. 1. Student Powerpoint
3	Evaluate (Assessment / Closure)	Pose an exit ticket question.	Exit ticket: What topics could be used for data mining in social media?

Core Vocabulary	[REQUIRED]: [ADDITIONAL]: Developer account, mining, API, access token, authentication token, libraries, tweepy, pandas
Notes/Lesson Differentiation	● Students will be onboarded on data gathering within social media context. ● Students will create a developer account . ● Students will be walked through a running code to extract data from Twitter.

Introduction 2 - Introduction to Data Visualization

The Introduction to Data Visualization lesson aims to impart foundational knowledge and skills in the area of data visualization to students. Utilizing tools such as Google Earth and Word Clouds, as well as exploring data visualization in Excel, students will learn to effectively analyze and present one and two-dimensional data. Through engaging lectures and hands-on activities, students will gain a comprehensive understanding of the different chart styles suitable for various data sets, and will learn to identify and address challenges such as missing data, data normalization, and data reduction. The central inquiry posed in this lesson is "How can we extract meaningful insights from data using visualization techniques?" Key concepts and terminology including Word Clouds, Google Earth Engine, one- and two-dimensional data, data normalization, data reduction, noisy data, Not a Number (NaN), and Pandas will be covered. The lesson has been designed to accommodate diverse learning styles and includes differentiation strategies to ensure that all students can participate and succeed.

<table>
<tr><th>Teacher</th><th>Course</th><th>Lesson Date</th><th>Unit</th></tr>
<tr><td>Sandy Marie Romo</td><td>Computer Science</td><td>Day 2</td><td>Introduction to Data Visualization</td></tr>
<tr><th colspan="4">Board Configuration</th></tr>
<tr><td>Aims</td><td colspan="3">Students will gain the following skills:</td></tr>
<tr><td>A:</td><td colspan="3">Basic data visualizations using common tools such as Google Earth and Word Cloud</td></tr>
<tr><td>B:</td><td colspan="3">Visualize one and two dimensional data using Excel.</td></tr>
<tr><td>C:</td><td colspan="3">Identify suitable chart style to visualize data sets.</td></tr>
<tr><td colspan="2">Objective</td><td colspan="2">Essential Question</td></tr>
<tr><td colspan="2">Students will be able to create simple visualizations in order to better understand data and identify trends.</td><td colspan="2">How can we extract data from Twitter?</td></tr>
<tr><th colspan="4">Lesson Agenda</th></tr>
<tr><td>Agenda/Time</td><td>5 E’s</td><td colspan="2">Learning Activities</td></tr>
<tr><td></td><td></td><td>Teacher will…</td><td>Students will …</td></tr>
<tr><td>1</td><td>Engage (Quick Start/ Discuss)</td><td>Teacher will post questions on board and facilitate discussion highlighting [answer].</td><td>What is data visualization and how can we use data visualization skills to understand data and identify trends??
Answer: It is the representation of data through use of graphics; it can be used to show patterns (e.g., like/dislike) that have been identified on a variety of topics (e.g., rap artists)</td></tr>
<tr><td rowspan="2">2</td><td>Explain (Guided Practice)</td><td>Lecture with multimedia slides. 2. Introduction to Data Visualization.pptx</td><td>Students will take notes. 2. student powerpoint</td></tr>
<tr><td>Extend/ Elaborate</td><td>Teachers will onboard students on a variety of data sets, and data visualization websites.</td><td>Visit these websites to look at data sets and data visualization. Earth Engine, Word Cloud, Covid Tracking.</td></tr>
</table>

3	**Evaluate (Assessment/ Closure)**	Pose an exit ticket question.	Exit ticket: What's Texas's increment number of positive covid cases in the last recorded day?
Core Vocabulary	[REQUIRED]: Wordcloud, Google Earth Engine, two dimensional data, One dimensional data. [ADDITIONAL]: Data normalization, data reduction, noisy data, Not a Number (NaN), pandas		
Notes/Lesson Differentiation	● Students will be onboarded to learn about missing data, missing values, and noisy data. ● Students will be walked through a Data Normalization process. ● Students will be walked through a Data Reduction process.		

Introduction 3 - Let's Analyze

The Introduction to Data Analysis lesson will be an engaging and hands-on experience for students. The teacher will initiate a board discussion by posing questions related to the two types of data analysis and their applications in data mining. This will be followed by analysis identification and qualitative analysis activities where students will put their knowledge into practice. Additionally, students will participate in a frequency analysis activity to further deepen their understanding of data analysis techniques. To assess student learning and understanding, an exit ticket question will be posed at the end of the lesson. This question will ask students to identify 2-3 qualitative and 2-3 quantitative measurements that can be used to define the area of El Paso, and to discuss the advantages and disadvantages of each. The lesson has been designed to provide students with opportunities to engage with the material, practice their analysis skills, and receive immediate feedback on their understanding.

Teacher	Course	Lesson Date	Unit
Sandy Marie Romo	**Computer Science**	**Day 3**	**Introduction to Data Analysis**

Board Configuration	
Aims	**Students will gain the following skills:**
A:	Basic data manipulation techniques
B:	Basic data conversion techniques and supporting tools.

Objective	**Essential Question**
Students will be able to perform basic data analysis in order to better understand data, its types, and structures.	How can we extract data from Twitter?

Lesson Agenda			
Agenda/Time	**5 E's**	**Learning Activities**	
		Teacher will…	**Students will …**
1	**Engage (Quick Start/ Discuss)**	Teacher will post questions on board and facilitate discussion highlighting [answer].	What are the two types of data analysis, and how could either one be used in data mining? **Answer**: Qualitative and Quantitative; (e.g., types of preferred food for qualitative data–spicy, sweet, sour, seasoned, etc; average number of pets at a household for quantitative data.
2	**Explain (Guided Practice)**	Lecture with multimedia slides. 3. Introduction to Data Analysis.pptx	Students will take notes. 3. student powerpoint
	Extend/ Elaborate	Teacher will introduce analysis activities	Students will participate in an analysis identification activity, qualitative analysis activity, and frequency

3	**Evaluate (Assessment/ Closure)**	Pose an exit ticket question.	Exit ticket: Identify 2-3 qualitative and 2-3 quantitative measurements that we can use to define the area of El Paso What are the advantages and disadvantages of each?
Core Vocabulary	[REQUIRED]: Qualitative data analysis, Ordinal Categories, Named Categories, Qualitative data. [ADDITIONAL]: Quantitative data analysis, minimum, maximum, mean, variability analysis, range, mode, interquartile range, outlier, variance		
Notes/Lesson Differentiation	● Students will be onboarded on quantitative data analysis. ● Students will do a quantitative analysis activity (discover minimum, maximum, and mean. ● Students will be onboarded on variability analysis. ● Students will do a variability analysis (discover range, mode, interquartile range. ● Students will be onboarded on outliers analysis and variance analysis.		

Introduction 4 -Data Gathering

In this computer science lesson, students will be introduced to data gathering techniques, focusing on importing and exporting quantitative data using Python. The teacher, Sandy Marie Romo, has prepared a multimedia presentation to explain the basics of data gathering, including key terms like web data mining, in-person interviews, and data export/import. Students will engage in discussion, take notes, and participate in hands-on activities to practice importing and exporting data. To assess their understanding, they will be asked an exit ticket question about the types of data they think would be useful for El Paso or Texas. The lesson aims to equip students with the ability to execute existing code to import, export, and aggregate data from multiple sources.

<table>
<tr><th>Teacher</th><th>Course</th><th>Lesson Date</th><th>Unit</th></tr>
<tr><td>Sandy Marie Romo</td><td>Computer Science</td><td>Day 4</td><td>Introduction to Data Gathering</td></tr>
<tr><th colspan="4">Board Configuration</th></tr>
<tr><td>Aims</td><td colspan="3">Students will gain the following skills:</td></tr>
<tr><td>A:</td><td colspan="3">Execute existing code to import and export simple quantitative data</td></tr>
<tr><td>B:</td><td colspan="3">Execute existing code to collect and aggregate data from multiple sources</td></tr>
<tr><th colspan="2">Objective</th><th colspan="2">Essential Question</th></tr>
<tr><td colspan="2">Students will be able to import and export data using Python in order to manipulate Data using different tools.</td><td colspan="2">How can we extract data from Twitter?</td></tr>
<tr><th colspan="4">Lesson Agenda</th></tr>
<tr><th>Agenda/Time</th><th>5 E’s</th><th colspan="2">Learning Activities</th></tr>
<tr><th></th><th></th><th>Teacher will…</th><th>Students will …</th></tr>
<tr><td>1</td><td>Engage (Quick Start/ Discuss)</td><td>Teacher will post questions on board and facilitate discussion highlighting [answer].</td><td>What is the first step of data mining?
Answer: Data Gathering
Can you describe some actions you can make to carry out this step?
Answer: e.g., identify what should be gathered, identify your sample.</td></tr>
<tr><td rowspan="2">2</td><td>Explain (Guided Practice)</td><td>Lecture with multimedia slides.
4. Introduction to Data Gathering.pptx</td><td>Students will take notes.
4. student powerpoint</td></tr>
<tr><td>Extend/ Elaborate</td><td>Teacher will introduce activities about exporting and importing data.</td><td>Students will participate in a data export activity, and data import activity.</td></tr>
<tr><td>3</td><td>Evaluate (Assessment/ Closure)</td><td>Pose an exit ticket question.</td><td>Exit ticket:
What type of data do you think would be useful to gather for El Paso or Texas? Why?</td></tr>
</table>

Core Vocabulary	[REQUIRED]:Web data mining, In-person interview, Download/export. [ADDITIONAL]: Histogram, density plot, box plot, scatter plot, statistical distribution, density distribution, BIN size, pandas
Notes/Lesson Differentiation	● Students will be onboarded on the different types of visual statistic distributions. ● Student will be walked through running code to perform statistical distributions (e.g.,

Introduction 5 - Statistics

In this Statistics lesson for a Computer Science course taught by Sandy Marie Romo, students will learn to understand and calculate basic descriptive analysis, use and manipulate existing Python code to extract descriptive analysis, generate basic descriptive analysis diagrams, and customize Python code to create customized diagrams. The lesson aims to enable students to extract statistical information from data, specifically focusing on Twitter data. It will incorporate a variety of learning activities, such as engaging discussions, guided practice through multimedia slides, and an exit ticket question for assessment. Throughout the lesson, students will be introduced to core vocabulary terms related to statistics and data visualization, and will explore data visualization processes using both Excel and Google Colab.

Teacher	Course	Lesson Date	Unit
Sandy Marie Romo	**Computer Science**	**Day 5**	**Introduction to Statistics**

Board Configuration	
Aims	**Students will gain the following skills:**
A:	Understand and calculate basic descriptive analysis
B:	Use and manipulate existing Python code to extract descriptive analysis
C:	Use and manipulate existing python code to generate basic descriptive analysis diagrams
D:	Manipulate and customize Python code to generate customized diagrams.

Objective	**Essential Question**
Students will be able to use and manipulate existing Python code in order to extract basic statistical information from data.	How can we extract data from Twitter?

Lesson Agenda			
Agenda/Time	**5 E's**	**Learning Activities**	
		Teacher will…	**Students will …**
1	**Engage (Quick Start/ Discuss)**	Teacher will post questions on board and facilitate discussion highlighting [answer].	Identify statistical measurements that we've seen previously? **Answer**: Mean, median, standard deviation, etc. Explain how these might be used to pursue a personal interest or address community's concerns? **Answer**: e.g., the mean number of people who took the third COVID-19 booster shot, mode for people who frequently got sick, etc.
2	**Explain (Guided Practice)**	Lecture with multimedia slides. 5. Introduction to Statistics.pptx	Students will take notes. 5. student powerpoint

3	**Evaluate (Assessment/ Closure)**	Pose an exit ticket question.	Exit ticket: What are some common measures of central tendency and variation used in statistical analysis? Name two other problems where we need to apply the descriptive statistics. **Answer**: Median, & Range; Age of people crossing the El Paso-Juarez border (e.g., median: 27 yo, range: 18yo to 77 yo.
Core Vocabulary	[REQUIRED]: Statistics, Measure of Variability, Descriptive statistics. [ADDITIONAL]: Column chart, pie chart, line chart, scatter chart, pivot table, matplotlib, seaborn		
Notes/Lesson Differentiation	● Students will be onboarded on different types of data visualization. ● Students will be walked through the data visualization processes through Excel. ● Students will be walked through the data visualization processes through Google Colab.		

Introduction 6 - Data Pre-processing

The Introduction to Data Pre-processing lesson is designed to impart essential knowledge and skills related to data preprocessing. Students will learn the importance of data preprocessing and how to identify data characteristics that require preprocessing. Through hands-on activities and multimedia lectures, students will develop the skills to address missing data, inconsistent data, and noisy data. The lesson will begin with a discussion on data mining, followed by a lecture on data preprocessing and a multimedia presentation. Students will then engage in activities to identify missing and noisy data. The lesson will conclude with an exit ticket question to assess student understanding, and core vocabulary such as data processing, noisy data, normalization, attribute selection, and data reduction will be covered, along with additional concepts such as various chart types and visualization tools. Students will also have the opportunity to explore different data visualization processes through Excel and Google Colab.

Teacher	Course	Lesson Date	Unit
Sandy Marie Romo	**Computer Science**	**Day 6**	**Introduction to Data Pre-processing**

Board Configuration	
Aims	**Students will gain the following skills:**
A:	Understand the need for data preprocessing
B:	Identify data characteristics that needs preprocessing
C:	Conduct basic steps to identify and address missing data, inconsistent data, and noisy data.

Objective	**Essential Question**
Students will be able to perform basic data preprocessing in order to address missing data, inconsistent data, and noisy data	How can we extract data from Twitter?

Lesson Agenda

Agenda/Time	5 E's	Learning Activities	
		Teacher will…	**Students will …**
1	**Engage (Quick Start/ Discuss)**	Teacher will post questions on board and facilitate discussion highlighting [answer].	In data mining what is typically done after gathering data? Describe steps to carry out this process. Answer: Import and export data/ wrangling data
2	**Explain (Guided Practice)**	Lecture with multimedia slides 6. Introduction to Data Pre-processing.pptx	Students will take notes. 6. student powerpoint
	Extend/ Elaborate	Teacher will introduce activities about missing data, and noisy data.	Students will identify missing data, and noisy data.

3	**Evaluate (Assessment/ Closure)**	Pose an exit ticket question.	Exit Ticket: In a data set where we know people's age, what is an attribute that we can create? **Answer**: adult, younger adult, older adult, senior, toddler, teenager, etc. In a data set where we know people's opinion, what is an attribute we can create? **Answer**: constructive, likes/dislikes, etc.
Core Vocabulary	[REQUIRED]: Data processing, Noisy data, Normalization, Attribution Selection, Data Reduction. [ADDITIONAL]: Column chart, pie chart, line chart, scatter chart, pivot table, matplotlib, seaborn		
Notes/Lesson Differentiation	● Students will be onboarded on different types of data visualization. ● Students will be walked through the data visualization processes through Excel. ● Students will be walked through the data visualization processes through Google Colab.		

Introduction 7 - Coding

In this Introduction to Coding lesson, students will learn about basic data types in Python such as integers, floats, and dictionaries, as well as basic loop structures. The lesson aims to equip students with the skills to understand and use Python for data manipulation, analysis, and visualization, particularly in the context of extracting data from Twitter. The lesson will begin with an engaging discussion, followed by a multimedia lecture using the "7. Introduction to Coding.pptx" presentation. Students will then participate in hands-on activities, creating a Python notebook and working with variables, data types, and conditional statements. To assess their understanding, an exit ticket question will be posed, focusing on the use of conditional statements in code. The lesson also covers core vocabulary related to data visualization and provides differentiated instruction through various data visualization platforms, such as Excel and Google Colab.

<table>
<tr><th>Teacher</th><th>Course</th><th>Lesson Date</th><th>Unit</th></tr>
<tr><td>Sandy Marie Romo</td><td>Computer Science</td><td>Day 7</td><td>Introduction to Coding</td></tr>
<tr><th colspan="4">Board Configuration</th></tr>
<tr><td>Aims</td><td colspan="3">Students will gain the following skills:</td></tr>
<tr><td>A:</td><td colspan="3">Understand basic data types in Python (integer, float, dictionary)</td></tr>
<tr><td>B:</td><td colspan="3">Understand basic loop structures</td></tr>
<tr><td colspan="2">Objective</td><td colspan="2">Essential Question</td></tr>
<tr><td colspan="2">Students will be able to understand basic Python code in order to use Python to manipulate, analyze, and visualize data.</td><td colspan="2">How can we extract data from Twitter?</td></tr>
<tr><th colspan="4">Lesson Agenda</th></tr>
<tr><th>Agenda/Time</th><th>5 E’s</th><th colspan="2">Learning Activities</th></tr>
<tr><th></th><th></th><th>Teacher will…</th><th>Students will …</th></tr>
<tr><td>1</td><td>Engage (Quick Start/ Discuss)</td><td>Teacher will post questions on board and facilitate discussion highlighting [answer].</td><td>What approach can you use to mine large amounts of datasets? Identify some steps you’ll need to take
Answer: Coding; Gather data, preprocessing,</td></tr>
<tr><td rowspan="2">2</td><td>Explain (Guided Practice)</td><td>Lecture with multimedia slides 7. Introduction to Coding.pptx</td><td>Students will take notes.
7. student powerpoint</td></tr>
<tr><td>Extend/ Elaborate</td><td>Teacher will introduce activities about coding.</td><td>Students will Create a python notebook, do coding variables, data types, and conditional statement.</td></tr>
</table>

3	**Evaluate (Assessment/ Closure)**	Pose an exit ticket question.	Exit Ticket: Name an instance in code where we can use conditional statements. Can you think of one that can be used for numeric and another for non-numeric data sets? **Answer**: If ___, then ___ ; e.g., numeric: If a student spent *0.5 years* in highschool, then they are a *freshman*; Non-numeric: if a person *completed* their university studies, then they have a *degree*.
Core Vocabulary	[REQUIRED]: Object-Oriented, Colab, numeric value. [ADDITIONAL]: Column chart, pie chart, line chart, scatter chart, pivot table, matplotlib, seaborn		
Notes/Lesson Differentiation	• Students will be onboarded on different types of data visualization. • Students will be walked through the data visualization processes through Excel. • Students will be walked through the data visualization processes through Google Colab.		

GUIDED INQUIRY

Guided Inquiry 8 - Let's Gather some data

In this lesson, students will develop essential skills such as understanding different data sources, setting up data connections using the Twitter API, manipulating basic queries, and extracting data from Twitter. The objective is for students to manage code and run queries against Twitter to extract data. The lesson will begin with an engaging discussion, followed by a multimedia lecture where students will take notes. Next, students will participate in hands-on coding activities to collect data from Twitter. An exit ticket question will be posed to assess understanding, focusing on hashtag-related data collection. Core vocabulary for this lesson includes mine, mining statistics, developer account, information, and additional terms related to data visualization. Students will be onboarded on different types of data visualization and guided through the data visualization processes using Excel and Google Colab for differentiation.

<table>
<tr><th>Teacher</th><th>Course</th><th>Lesson Date</th><th>Unit</th></tr>
<tr><td>Sandy Marie Romo</td><td>Computer Science</td><td>Day 8</td><td>Let's Gather some data</td></tr>
<tr><th colspan="4">Board Configuration</th></tr>
<tr><td>Aims</td><td colspan="3">Students will gain the following skills:</td></tr>
<tr><td>A:</td><td colspan="3">Understand different data sources</td></tr>
<tr><td>B:</td><td colspan="3">Understand basic code to set up data connection using Twitter API</td></tr>
<tr><td>C:</td><td colspan="3">Understand and manipulate basic queries</td></tr>
<tr><td>D:</td><td colspan="3">Understand and execute code to extract data from Twitter</td></tr>
<tr><td colspan="2">Objective</td><td colspan="2">Essential Question</td></tr>
<tr><td colspan="2">Students will be able to manipulate code run queries against Twitter in order to extract data from Twitter</td><td colspan="2">How can we extract data from Twitter?</td></tr>
<tr><th colspan="4">Lesson Agenda</th></tr>
<tr><td>Agenda/Time</td><td>5 E's</td><td colspan="2">Learning Activities</td></tr>
<tr><td></td><td></td><td>Teacher will…</td><td>Students will …</td></tr>
<tr><td>1</td><td>Engage (Quick Start/ Discuss)</td><td>Teacher will post questions on board and facilitate discussion highlighting [answer].</td><td>In the context of data mining, can you suggest any social media platforms or news websites from which we can extract data?
e.g., Twitter, Facebook, CNN, NBC</td></tr>
<tr><td rowspan="2">2</td><td>Explain (Guided Practice)</td><td>Lecture with multimedia slides 8. Guided Inquiry 1 - Let's Gather some data.pptx</td><td>Students will take notes.
8. student powerpoint</td></tr>
<tr><td>Extend/ Elaborate</td><td>Teacher will introduce activities about coding.</td><td>Students will code to collect data from twitter.</td></tr>
</table>

3	**Evaluate (Assessment/ Closure)**	Pose an exit ticket question.	Exit ticket: Which hashtag related data would you be interested in collecting? This can be culturally, personally, or politically significant. Why? Note: you can use coding ideas from Slide 14. e.g., #love, #art, #music
Core Vocabulary	[REQUIRED]: mine, mining statistics, developer account, information [ADDITIONAL]: Column chart, pie chart, line chart, scatter chart, pivot table, matplotlib, seaborn		
Notes/Lesson Differentiation	● Students will be onboarded on different types of data visualization. ● Students will be walked through the data visualization processes through Excel. ● Students will be walked through the data visualization processes through Google Colab.		

Guided Inquiry 9 - Let's Do Preprocessing

In this lesson, students will develop essential skills in data preprocessing, including basic techniques to identify missing and noisy data and data normalization and reduction. The objective is for students to understand and manipulate Python code to perform basic data preprocessing steps. The lesson will start with an engaging discussion on the difference between noisy and missing data in data preprocessing. This will be followed by a multimedia lecture, during which students will take notes. Next, students will participate in hands-on activities related to identifying missing and noisy data through programming and working on data reduction. An exit ticket question will be posed to assess understanding, focusing on which column should undergo data reduction. Core vocabulary for this lesson includes dataset, noisy data, data normalization, data reduction, and additional terms related to data visualization. Students will be onboarded on different types of data visualization and guided through the data visualization processes using Excel and Google Colab for differentiation.

<table>
<tr><th>Teacher</th><th>Course</th><th>Lesson Date</th><th>Unit</th></tr>
<tr><td>Sandy Marie Romo</td><td>Computer Science</td><td>Day 9</td><td>Guided Inquiry 2 - Let's Do Preprocessing</td></tr>
<tr><th colspan="4">Board Configuration</th></tr>
<tr><td>Aims</td><td colspan="3">Students will gain the following skills:</td></tr>
<tr><td>A:</td><td colspan="3">Basic technique to identify missing, and noisy data</td></tr>
<tr><td>B:</td><td colspan="3">Basic technique for data normalization and reduction</td></tr>
<tr><th colspan="2">Objective</th><th colspan="2">Essential Question</th></tr>
<tr><td colspan="2">Students will be able to understand and manipulate Python code in order to perform basic data preprocessing steps.</td><td colspan="2">How can we extract data from Twitter?</td></tr>
<tr><th colspan="4">Lesson Agenda</th></tr>
<tr><th>Agenda/Time</th><th>5 E's</th><th colspan="2">Learning Activities</th></tr>
<tr><td></td><td></td><td>Teacher will…</td><td>Students will …</td></tr>
<tr><td>1</td><td>Engage (Quick Start/ Discuss)</td><td>Teacher will post questions on board and facilitate discussion highlighting [answer].</td><td>What is the difference between Noisy Data and Missing Data in data preprocessing? Why is it important to be aware of each? Answer: noisy data is meaningless/irrelevant data, whilst missing data is empty data</td></tr>
<tr><td rowspan="2">2</td><td>Explain (Guided Practice)</td><td>Lecture with multimedia slides 9. Guided Inquiry 2 - Let's Do Preprocessing.pptx</td><td>Students will take notes; Both of these need to be taken out of a revised data document 9. student powerpoint</td></tr>
<tr><td>Extend/ Elaborate</td><td>Teacher will introduce activities about identifying missing and noisy data through programming.</td><td>Students will do the activities:
1. Identify missing values
2. Identify noisy values</td></tr>
</table>

	Extend/ Elaborate	Teacher will onboard the students on data reduction activity in slide 12	Students will run the code in slide 12, and show results through jamboard.
3	**Evaluate (Assessment/ Closure)**	Pose an exit ticket question.	Exit ticket: Look at Slide 11, For which column do you think we should perform data reduction? Note: You can use ideas from data reduction coding in Slide 12 Link.
Core Vocabulary	[REQUIRED]: Dataset, Noisy Data, Data Normalization, Data Reduction [ADDITIONAL]: Column chart, pie chart, line chart, scatter chart, pivot table, matplotlib, seaborn		
Notes/Lesson Differentiation	• Students will be onboarded on different types of data visualization. • Students will be walked through the data visualization processes through Excel. • Students will be walked through the data visualization processes through Google Colab.		

Guided Inquiry 10 - Let’s Analyze

In this lesson, students will develop their ability to apply descriptive statistics for the analysis and manipulation of datasets through the Guided Inquiry. The lesson commences with an interactive board discussion, during which the instructor poses thought-provoking questions and stimulates conversation surrounding the utilization of pre-existing Python code for rudimentary quantitative data analysis and the identification of outliers within data mining. Subsequently, students engage in a guided practice, attentively taking notes during a comprehensive multimedia lecture on the subject matter. To evaluate their grasp of the content, an exit ticket question is presented, requesting students to assess the implications of a dataset containing minimal likes yet an excess of a thousand replies. Furthermore, students become acquainted with a diverse range of data visualization techniques, encompassing column charts, pie charts, line charts, scatter charts, pivot tables, and the use of matplotlib and seaborn. They are granted the opportunity to delve into data visualization processes utilizing tools such as Excel and Google Colab. The fundamental question driving this lesson is, "How can we extract meaningful insights from data using visualization techniques?"

Teacher	**Course**	**Lesson Date**	**Unit**
Sandy Marie Romo	**Computer Science**	**Day 10**	**10. Guided Inquiry 3 - Let’s Analyze**

Board Configuration	
Aims	**Students will gain the following skills:**
A:	Use existing Python code to calculate basic Quantitative Data Analysis
B:	Use existing Python code to identify outliers
C:	Use existing Python code to identify outliers

Objective	**Essential Question**
Students will be able to apply descriptive statistics in order to analyze and manipulate datasets.	How can we extract data from Twitter?

Lesson Agenda			
Agenda/Time	**5 E’s**	**Learning Activities**	
		Teacher will…	**Students will …**
1	**Engage (Quick Start/ Discuss)**	Teacher will post questions on board and facilitate discussion highlighting [answer].	How can existing Python code be used to perform basic quantitative data analysis in data mining? How would you go about analyzing qualitative data using python? **Answer**: By using data analysis libraries such as NumPy, or matplotlib; by quantifying identified patterns of qualitative data.

2	**Explain (Guided Practice)**	Lecture with multimedia slides 10. Guided Inquiry 3 - Let's Analyze.pptx	Students will take notes. 10. Student PowerPoint
3	**Evaluate (Assessment/ Closure)**	Pose an exit ticket question.	What does it mean for you when a person has few likes, but over a thousand replies? Can this be used in analysis?
Core Vocabulary	[REQUIRED]: Variance, Range, mode, Quantitative Data Analysis [ADDITIONAL]: Column chart, pie chart, line chart, scatter chart, pivot table, matplotlib, seaborn		
Notes/Lesson Differentiation	• Students will be onboarded on different types of data visualization. • Students will be walked through the data visualization processes through Excel. • Students will be walked through the data visualization processes through Google Colab.		

Guided Inquiry 11 - Let’s Do Statistics

In this lesson, students will enhance their Python coding skills by learning how to manipulate pre-existing code to generate statistical visualizations. The lesson, titled Guided Inquiry - Let's Do Statistics, will begin with an engaging and interactive discussion on the topic of extracting data from Twitter. Following this, students will be guided through a comprehensive multimedia lecture, during which they will take notes and learn different types of data visualization techniques such as histograms, boxplots, and scatterplots. To evaluate their understanding of the material, an exit ticket question will be presented, prompting students to imagine a histogram of their favorite artist's popularity throughout the years. Throughout the lesson, students will have the opportunity to practice data visualization processes using Excel and Google Colab, while becoming familiar with visualization libraries such as matplotlib and seaborn. The ultimate goal of this lesson is to enable students to apply their newfound skills in manipulating Python code to generate meaningful insights from data using visualization techniques.

<table>
<tr><th>Teacher</th><th>Course</th><th>Lesson Date</th><th>Unit</th></tr>
<tr><td>Sandy Marie Romo</td><td>Computer Science</td><td>Day 11</td><td>11. Guided Inquiry 4 - Let’s Do Statistics</td></tr>
<tr><th colspan="4">Board Configuration</th></tr>
<tr><td>Aims</td><td colspan="3">Students will gain the following skills:</td></tr>
<tr><td>A:</td><td colspan="3">Manipulate existing Python code to visualize statistical distribution.</td></tr>
<tr><td>B:</td><td colspan="3">Manipulate existing python code for boxplot analysis.</td></tr>
<tr><td>C:</td><td colspan="3">Manipulate Python code to visualize statistical relationship.</td></tr>
<tr><th colspan="2">Objective</th><th colspan="2">Essential Question</th></tr>
<tr><td colspan="2">Students will be able to manipulate existing Python code in order to generate statistical visualizations.</td><td colspan="2">How can we extract data from Twitter?</td></tr>
<tr><th colspan="4">Lesson Agenda</th></tr>
<tr><th>Agenda/Time</th><th>5 E’s</th><th colspan="2">Learning Activities</th></tr>
<tr><th></th><th></th><th>Teacher will…</th><th>Students will …</th></tr>
<tr><td>1</td><td>Engage (Quick Start/ Discuss)</td><td>Teacher will post questions on board and facilitate discussion highlighting [answer].</td><td>How can Python code be modified to create visualization of statistical distribution in data mining? What is your preferred visualization and why?
Answer: We can use data visualization libraries such as matplotlib or seaborn</td></tr>
<tr><td>2</td><td>Explain (Guided Practice)</td><td>Lecture with multimedia slides 11. Guided Inquiry 4 - Let’s Do Statistics.pptx</td><td>Students will take notes.
11. Student PowerPoint</td></tr>
</table>

3	**Evaluate (Assessment/ Closure)**	Pose an exit ticket question.	What would a histogram of popularity throughout the years of your favorite artist look like?
Core Vocabulary	[REQUIRED]: mine, mining statistics, developer account, information [ADDITIONAL]: Column chart, pie chart, line chart, scatter chart, pivot table, matplotlib, seaborn		
Notes/Lesson Differentiation	● Students will be onboarded on different types of data visualization. ● Students will be walked through the data visualization processes through Excel. ● Students will be walked through the data visualization processes through Google Colab.		

Guided Inquiry 12 - Let's Visualize

In this lesson, Let's Visualize, students will learn advanced data visualization techniques using Python MatPlotLib and Seaborn libraries, as well as Excel's advanced data charts and pivot tables. Through the use of Python libraries and the IBM Watson Community Portal, students will learn how to extract data from Twitter and visualize it using various methods. The lesson will commence with a discussion on the final step of data mining, which is data visualization, and its importance. Students will then be guided through a multimedia lecture, taking notes and practicing data visualization processes using Excel and Google Colab. The lesson will conclude with an assessment in the form of an exit ticket, prompting students to imagine possible variables that could replace 'smoker' and 'non-smoker' in a catplot graph of El Paso. The ultimate goal of the lesson is to enable students to extract and visualize data effectively, utilizing various visualization tools and techniques.

Teacher	Course	Lesson Date	Unit
Sandy Marie Romo	**Computer Science**	**Day 12**	**12. Guided Inquiry 5 - Let's Visualize**

Board Configuration	
Aims	**Students will gain the following skills:**
A:	Use Excel advanced Data Charts
B:	Use Excel Pivot Tables
C:	Use Python MatPlotLib and Seaborn libraries

Objective	**Essential Question**
Students will be able to use Python Libraries and IBM Watson Community Portal in order to visualize data using several methods.	How can we extract data from Twitter?

Lesson Agenda

Agenda/Time	5 E's	Learning Activities	
		Teacher will…	**Students will …**
1	**Engage (Quick Start/ Discuss)**	Teacher will post questions on board and facilitate discussion highlighting [answer].	What is the final step of data mining? What will the first lines of code be about?Why is this step important and how would you carry this out using python? **Answer**: Data Visualization; Import libraries, this step is always present.
2	**Explain (Guided Practice)**	Lecture with multimedia slides 12. Guided Inquiry 5 - Let's Visualize.pptx	Students will take notes. 12. Student PowerPoint

3	**Evaluate (Assessment/ Closure)**	Pose an exit ticket question.	Now that you looked at the graph in slide 15 called catplot, Imagine some possible variables that could replace 'smoker' and 'non-smoker' that would be interesting to find out about El Paso. What are they?
Core Vocabulary	[REQUIRED]: Seaborn, notebook, Google colab, Matplotlib [ADDITIONAL]: Column chart, pie chart, line chart, scatter chart, pivot table, matplotlib, seaborn		
Notes/Lesson Differentiation	● Students will be onboarded on different types of data visualization. ● Students will be walked through the data visualization processes through Excel. ● Students will be walked through the data visualization processes through Google Colab.		

SCAFFOLDED INQUIRY

Scaffolded Inquiry 13 - Let’s Gather Twitter Data

This Computer Science lesson - Let's Gather Twitter Data, will teach students how to extract datasets from Twitter using Python. Students will manipulate existing Python code to connect to the Twitter API and extract data using various queries, while developing basic troubleshooting and communication skills. The lesson will begin with a discussion on the necessary requirements for coding, such as a developer account, Twitter application, API key, and access token, and their purpose for authenticating access to the data. Through a multimedia lecture, students will take notes and practice data visualization processes using Excel and Google Colab. The lesson will conclude with an assessment in the form of an exit ticket, prompting students to explain what they searched for and why. The ultimate goal of the lesson is to enable students to set up a connection to the Twitter API and extract datasets effectively using Python.

Teacher	**Course**	**Lesson Date**	**Unit**
Sandy Marie Romo	**Computer Science**	**Day 13**	**13. Scaffolded Inquiry 1- Let’s Gather Twitter Data**

Board Configuration	
Aims	**Students will gain the following skills:**
A:	Manipulate existing python code to connect to Twitter API
B:	Manipulate existing queries to extract data from Twitter
C:	Basic troubleshooting skills
D:	Communicating data mining results

Objective	**Essential Question**
Students will be able to set up connection to twitter API in order to extract datasets.	How can we extract data from Twitter?

Lesson Agenda			
Agenda/Time	**5 E’s**	**Learning Activities**	
		Teacher will…	**Students will …**
1	**Engage (Quick Start/ Discuss)**	Teacher will post questions on board and facilitate discussion highlighting [answer].	What must we have before we start coding? What is the purpose of it? **Answer:** e.g., developer account, Twitter application, api key, access token, etc. It’s for authenticating access to the data.

2	**Explain (Guided Practice)**	Lecture with multimedia slides 13. Scaffolded Inquiry 1 - L…	Students will take notes. 13. Student PowerPoint
3	**Evaluate (Assessment/ Closure)**	Pose an exit ticket question.	What did you search for and why?
Core Vocabulary	Column chart, pie chart, line chart, scatter chart, pivot table, matplotlib, seaborn		
Notes/Lesson Differentiation	• Students will be onboarded on different types of data visualization. • Students will be walked through the data visualization processes through Excel. • Students will be walked through the data visualization processes through Google Colab.		

Scaffolded Inquiry 14 - Let’s analyze Twitter Data

In this Computer Science lesson - Let's Analyze Twitter Data, students will learn how to extract data from Twitter and analyze it using descriptive and variability analysis. Through a multimedia lecture, students will gain the skills necessary to identify appropriate descriptive and variability analysis to answer questions about Twitter data, as well as examine the data to determine the presence of outliers. The lesson will commence with a discussion on which descriptive statistics to use on the data and how, followed by note-taking and data visualization practices using Excel and Google Colab. The lesson will conclude with an assessment in the form of an exit ticket, prompting students to identify patterns in the data that they gathered. The ultimate goal of this lesson is to enable students to gain valuable skills in analyzing Twitter data and identifying patterns.

Teacher	**Course**	**Lesson Date**	**Unit**
Sandy Marie Romo	**Computer Science**	**Day 14**	**14. Scaffolded Inquiry 2 - Let’s analyze Twitter Data**

Board Configuration	
Aims	**Students will gain the following skills:**
A:	Identify appropriate descriptive analysis to answer questions about twitter data
B:	Identify appropriate variability analysis to answer questions about twitter data
C:	Examine twitter data to determine the presence of outliers.

Objective	**Essential Question**
Students will be able to identify and apply descriptive statistics and data variability analysis in order to objectively answer questions	How can we extract data from Twitter?

Lesson Agenda			
Agenda/Time	**5 E’s**	**Learning Activities**	
		Teacher will…	**Students will …**
1	**Engage (Quick Start/ Discuss)**	Teacher will post questions on board and facilitate discussion highlighting [answer].	Which descriptive statistics do you plan to use on your data? How? **Answer:** e.g., Average, mode, etc. The average number of people concerned on crossing the border is X, more people express concern on crossing over to El Paso, rather than Juarez.

2	**Explain (Guided Practice)**	Lecture with multimedia slides 14. Scaffolded Inquiry 2 - L…	Students will take notes. 14. Student PowerPoint
3	**Evaluate (Assessment/ Closure)**	Pose an exit ticket question.	Now that you gathered the data, what patterns caught your eye on data that you gathered?
Core Vocabulary	[REQUIRED]: descriptive, Outlier, paste, variability, Boxplot, dataset [ADDITIONAL]:Column chart, pie chart, line chart, scatter chart, pivot table, matplotlib, seaborn		
Notes/Lesson Differentiation	• Students will be onboarded on different types of data visualization. • Students will be walked through the data visualization processes through Excel. • Students will be walked through the data visualization processes through Google Colab.		

Scaffolded Inquiry 15 - Twitter Data Visualization

This lesson, - Twitter Data Visualization, focuses on teaching students how to use advanced features in Matplotlib and Seaborn data visualization libraries to construct advanced visualizations. Students will gain skills in identifying suitable visualizations through experimentation and customizing them using advanced features. The lesson will begin with a discussion on the type of graph to use, such as a pie chart for comparisons within a single category. Through a multimedia lecture, students will take notes and practice data visualization processes using Excel and Google Colab. The lesson will conclude with an assessment in the form of an exit ticket, prompting students to identify the usefulness of their data and who else would be interested in it. The core vocabulary for the lesson will include column chart, pie chart, line chart, scatter chart, pivot table, Matplotlib, and Seaborn. The goal of the lesson is to equip students with valuable skills in data visualization and analysis.

Teacher	Course	Lesson Date	Unit
Sandy Marie Romo	**Computer Science**	**Day 15**	**15. Scaffolded Inquiry 3 - Twitter Data Visualization**

Board Configuration	
Aims	**Students will gain the following skills:**
A:	Identify suitable visualizations through experimentations
B:	Customize advanced visualizations using matplotlib and seaborn

Objective	**Essential Question**
Students will be able to use advanced features in matplotlib and seaborn data visualization libraries in order to construct advanced visualizations.	How can we extract data from Twitter?

Lesson Agenda

Agenda/Time	5 E's	Learning Activities	
		Teacher will…	**Students will …**
1	**Engage (Quick Start/ Discuss)**	Teacher will post questions on board and facilitate discussion highlighting [answer].	What type of graph are you interested in using? Why? **Answer:** e.g., Pie graph–it looks great for comparisons within a single category.
2	**Explain (Guided Practice)**	Lecture with multimedia slides 15. Scaffolded Inquiry 3 - L…	Students will take notes. 15. Student PowerPoint

3	**Evaluate (Assessment/ Closure)**	Pose an exit ticket question.	Now that your data can be understood clearly, what do you think it would be useful for? Who else would be interested in it?
Core Vocabulary	[REQUIRED]: frequent, Matplotlib, drawing, category [ADDITIONAL]: Column chart, pie chart, line chart, scatter chart, pivot table, matplotlib, seaborn		
Notes/Lesson Differentiation	● Students will be onboarded on different types of data visualization. ● Students will be walked through the data visualization processes through Excel. ● Students will be walked through the data visualization processes through Google Colab.		

FREE INQUIRY

Free Inquiry 16 - Choose a Topic for mining Twitter Data

This lesson, - Choose a Topic for Mining Twitter Data, teaches students how to select a topic/domain, identify questions, mine datasets, and analyze datasets in order to objectively answer questions related to their chosen topic/domain. The lesson begins with a discussion on the type of domain students are most interested in, such as sports and the most popular basketball teams. Through a multimedia lecture, students take notes and practice data visualization processes using Excel and Google Colab. The lesson concludes with an exit ticket assessment, prompting students to identify the type of context they would focus on, such as personal interest or sociopolitical issues. The core vocabulary for the lesson includes column chart, pie chart, line chart, scatter chart, pivot table, Matplotlib, and Seaborn. The goal of the lesson is to equip students with valuable skills in data mining and analysis to objectively answer questions related to their chosen topic/domain.

Teacher	**Course**	**Lesson Date**	**Unit**
Sandy Marie Romo	**Computer Science**	**Day 16**	**16. Free Inquiry 1 - Choose a Topic for mining Twitter Data**

Board Configuration	
Aims	**Students will gain the following skills:**
A:	Select a topic/domain and Identify questions
B:	Mine datasets pertaining to questions
C:	Analyze data sets in order to objectively answer questions

Objective	**Essential Question**
Students will be able to choose a topic for mining Twitter data and analyze data sets	How can we extract data from Twitter?

Lesson Agenda			
Agenda/Time	**5 E's**	**Learning Activities**	
		Teacher will…	**Students will …**

1	**Engage (Quick Start/ Discuss)**	Teacher will post questions on board and facilitate discussion highlighting [answer].	What type of domain are you most interested in? What kind of data would you be gathering from it? **Answer**: Sports, most popular basketball teams.
2	**Explain (Guided Practice)**	Lecture with multimedia slides 16. Free Inquiry 1 - Chose …	Students will take notes. 16. Student PowerPoint
3	**Evaluate (Assessment/ Closure)**	Pose an exit ticket question.	What type of context (i.e., personal interest, cultural issue, sociopolitical issue) would you be focusing on?
Core Vocabulary	[REQUIRED]: dataset, tweeted, trending, domain code, understand [ADDITIONAL]: Column chart, pie chart, line chart, scatter chart, pivot table, matplotlib, seaborn		
Notes/Lesson Differentiation	• Students will be onboarded on different types of data visualization. • Students will be walked through the data visualization processes through Excel. • Students will be walked through the data visualization processes through Google Colab.		

Free Inquiry 17 - Topic Sharing and Group Discussion

In this lesson- Topic Sharing and Group Discussion, students participate in an open discussion on topics, datasets, questions, and produced results related to their chosen topics. The lesson is designed to facilitate group discussions and sharing of insights from mining and analyzing Twitter data. The teacher kickstarts the discussion by posing thought-provoking questions on trending concepts or hashtags, such as vaccines or the United Nations. Through a multimedia lecture, students take notes and engage in data visualization processes using Excel and Google Colab. The lesson concludes with an exit ticket assessment that prompts students to reflect on the importance of knowing the context, such as personal interest or sociopolitical issues, that they will be using for data mining and analysis. The core vocabulary for the lesson includes column chart, pie chart, line chart, scatter chart, pivot table, Matplotlib, and Seaborn. The aim of the lesson is to foster collaboration and critical thinking among students in analyzing Twitter data and generating meaningful insights.

Teacher	Course	Lesson Date	Unit
Sandy Marie Romo	**Computer Science**	**Day 17**	**17. Free Inquiry 2 - Topic Sharing and Group Discussion**

Board Configuration	
Aims	**Students will gain the following skills:**
A:	Open discussion on topics
B:	Open discussion on datasets
C:	Open discussion on questions
D:	Open discussion on produced results

Objective	**Essential Question**
Students will be able to share topics and group discussion on datasets and results	How can we extract data from Twitter?

Lesson Agenda			
Agenda/Time	**5 E's**	**Learning Activities**	
		Teacher will…	**Students will …**

1	**Engage (Quick Start/ Discuss)**	Teacher will post questions on board and facilitate discussion highlighting [answer].	Which concepts or hashtags do you think are trending most now? **Answer**: e.g., vaccines, United Nations, etc.
2	**Explain (Guided Practice)**	Lecture with multimedia slides 17. Free Inquiry 2 - Topic S…	Students will take notes. 17. Powerpoint
3	**Evaluate (Assessment/ Closure)**	Pose an exit ticket question.	Why is it important to know the context (i.e., personal interest, cultural issue, sociopolitical issue) that we will be using for our data?
Core Vocabulary	[REQUIRED]: mining [ADDITIONAL]: Column chart, pie chart, line chart, scatter chart, pivot table, matplotlib, seaborn		
Notes/Lesson Differentiation	• Students will be onboarded on different types of data visualization. • Students will be walked through the data visualization processes through Excel. • Students will be walked through the data visualization processes through Google Colab.		