Unit 5: Categorical Data and Introduction to Linear Algebra

Content Area: **Mathematics**
Course(s):
Time Period: **January**
Length: **4 weeks**
Status: **Published**

Unit Overview:

In Unit 5, students explore the issues around skin tone representation in the media through a data-based exploration of skin tone representation in magazines. Students conduct both a categorical and a numerical analysis and compare the benefits and drawbacks of both. In their categorical analysis students create two-way tables based on their interpretation of the skin tones of the people pictured, and in the numerical analysis they use the RGB values of the images themselves. After both analyses, students chose an audience for whom the information would be relevant and write a data-supported piece to share their findings with that audience.

Essential Questions:

How can I gather data to analyze skin tone representation in the media and present my findings in a coherent article?

Enduring Understandings:

- Interpret results in the context of a situation.

- Identify, analyze, and synthesize relevant external resources to pose or solve problems.

- Summarize, represent, and interpret data on two categorical and quantitative variables.

Standards/Indicators/Student Learning Objectives (SLOs):

MATH.9-12.N.Q.A.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
MATH.9-12.N.Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
MATH.9-12.F.IF.A.1	Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.

MATH.9-12.S.IC.B.4	Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.
MATH.9-12.S.CP.A.4	Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities.
MATH.9-12.F.LE.B.5	Interpret the parameters in a linear or exponential function in terms of a context.

Lesson Titles:

- 5.1 Pros and Cons of Different Ways of Data Collecting
- 5.2 Collecting Categorical Data
- 5.3 Two-way Tables
- 5.4 Foundations in Linear Algebra: Working in Higher Dimensional Spaces
- 5.5 Introduction to Clustering
- 5.6 Probability

Career Readiness, Life Literacies, & Key Skills:

WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.7	Plan education and career paths aligned to personal goals.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
WRK.K-12.P.9	Work productively in teams while using cultural/global competence.

Inter-Disciplinary Connections:

CS.9-12.8.1.12.DA.1	Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
CS.9-12.8.1.12.DA.5	Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.
TECH.8.1.12.A.1	Create a personal digital portfolio which reflects personal and academic interests, achievements, and career aspirations by using a variety of digital tools and resources.
TECH.8.1.12.C.CS2	Communicate information and ideas to multiple audiences using a variety of media and formats.
TECH.8.1.12.E.CS4	Process data and report results.
TECH.8.1.12.F.CS3	Collect and analyze data to identify solutions and/or make informed decisions.

Equity Considerations

Holocaust Mandate

Topic:

Materials Used:

Addresses the Following Component of the Mandate:

- Bias
- Bigotry
- Bullying
- Holocaust Studies
- Prejudice

LGBTQ and Disabilities Mandate

Topic (Person and Contribution Addresses):

Materials Used:

Addresses the Following Component of the Mandate:

- Economic
- Political
- Social

Climate Change

Topic (Person and Contribution Addresses): Water Usage in Cities

Materials Used:

Addresses the Following Component of the Mandate:

Asian American Pacific Islander Mandate

Topic (Person and Contribution Addresses):

Skin Tone Representation in Magazines Project

Individually, write an article to share your findings on representation of skin tones in magazines. Your article should include what you have learned through videos, readings, class discussions, and visuals and analysis of your data. You will be submitting your article to your school newspaper, a local paper, a blog, your yearbook staff, or any other publication or organization who would benefit from your learning.

Materials Used:

Magazine Data

[Skin Tones and Representation Project: Criteria and Feedback Rubric](#)

Addresses the Following Component of the Mandate:

AAPI

- Economic
- Political
- Social

Summative Assessment:

Students will discuss different ways of collecting and analyzing data. First, students will collect and analyze categorical data on the representation of different skin tones in the media. After a categorical analysis using two-way tables, they learn to conceptualize color as points in multi-dimensional space and use a numerical/linear algebraic approach to analyze the same data using clustering. Students will create a piece of writing to communicate their data-supported findings around media representation of skin tones to an audience of their choosing.

- Build a Portfolio - Unit 5 Skin Tone Representations in Magazines Project

Benchmark Assessments

- Project-Based Assessment

- Skills Based Assessment

Alternative Assessment

- Journal Reflections
- Performance tasks
- Portfolios
- Presentations
- Project-based assignments

Formative Assessment:

- Data Talks/ Class Discussions
- Individual. Partner & Group Exploration Activities
- Jigsaw Assignments
- Math Journals

Resources & Materials:

This curriculum will introduce students to the main ideas in data science through free tools such as Google Sheets, Python, Data Commons and Tableau. Students will learn to be data explorers in project-based units, through which they will develop their understanding of data analysis, sampling, correlation/causation, bias and uncertainty, probability, modeling with data, making and evaluating data-based arguments, the power of data in society, and more! At the end of the course students will have a portfolio of their data science work to showcase their newly developed abilities.

- Data Sets & Visuals
- YouCubed High School Data Science Curriculum

Instructional Strategies, Learning Activities, and Levels of Blooms/DOK:

- Analyze the different models recognizing the affordances and limitations that they provide due to the data types and corresponding models

- Collect and organize categorical and numerical data

- Create scatter plots and bar graphs to model numerical data using technology

- Create two-ways tables to model categorical data

- Draw and communicate conclusions from the analysis of different models

- Have a conceptual understanding of an algorithm for clustering and apply it in the context of data analysis

Modifications

ELL Modifications:

- Choice of test format (multiple-choice, essay, true-false)
- Continue practicing vocabulary
- Provide study guides prior to tests
- Read directions to the student
- Read test passages aloud (for comprehension assessment)
- Vary test formats

G&T Modifications:

- Alternate assignments/enrichment assignments
- Enrichment projects
- Extension activities
- Higher-level cooperative learning activities
- Pairing direct instruction with coaching to promote self-directed learning
- Provide higher-order questioning and discussion opportunities
- Provide texts at a higher reading level
- Tiered assignments
- Tiered centers

At Risk Modifications

The possible list of modifications/accommodations identified for Special Education students can be utilized for At-Risk students. Teachers should utilize ongoing methods to provide instruction, assess student needs, and utilize modifications specific to the needs of individual students. In addition, the following may be considered:

- Additional time for assignments
- Adjusted assignment timelines
- Agenda book and checklists
- Answers to be dictated
- Assistance in maintaining uncluttered space
- Books on tape
- Concrete examples
- Extra visual and verbal cues and prompts

- Follow a routine/schedule

- Graphic organizers

- Have students restate information

- No penalty for spelling errors or sloppy handwriting

- Peer or scribe note-taking

- Personalized examples

- Preferential seating

- Provision of notes or outlines

- Reduction of distractions

- Review of directions

- Review sessions

- Space for movement or breaks

- Support auditory presentations with visuals

- Teach time management skills

- Use of a study carrel

- Use of mnemonics

- Varied reinforcement procedures

- Work in progress check

IEP & 504 Modifications:

*All teachers of students with special needs must review each student's IEP. Teachers must then select the appropriate modifications and/or accommodations necessary to enable the student to appropriately progress in the general curriculum.

Possible Modifications/Accommodations: (See listed items below):

- Allow for redos/retakes

- Assign fewer problems at one time (e.g., assign only odds or evens)

- Differentiated center-based small group instruction

- Extra time on assessments

- Highlight key directions

- If a manipulative is used during instruction, allow its use on a test

- Opportunities for cooperative partner work

- Provide reteach pages if necessary

- Provide several ways to solve a problem if possible

- Provide visual aids and anchor charts

- Test in alternative site

- Tiered lessons and assignments

- Use of a graphic organizer

- Use of concrete materials and objects (manipulatives)

- Use of word processor

Technology Materials and Standards

- Chromebooks
- CODAP
- Edublocks
- Google Colab
- Google Jamboard
- Google Sheets
- Google Slides
- Promethean Board
- Tableau

Computer Science and Design Thinking Standards

CS.6-8.DA   Data & Analysis