

# WCUUSD Scientific Inquiry and Content SLO

Education Quality Committee  
December 6, 2023

## STUDENT LEARNING OUTCOMES



WCSU exists to nurture and inspire in all students the passion, creativity, and power to contribute to their local and global communities.



### SCIENTIFIC INQUIRY AND CONTENT

#1

#### STRUCTURE AND FUNCTION

Understand that the ways in which an object or living thing is shaped and its substructure determine many of its properties and functions.

#4

#### SUSTAINABILITY

Understand that humans' impacts are greater than they have ever been, as are humans' abilities to model, predict, and manage current and future impacts in order to maintain human societies and the biodiversity that sustains them.

#2

#### MATTER AND ENERGY

Demonstrate understanding of the interactions between matter and energy in a system including the concepts of conservation of mass and energy.

#5

#### ENGINEERING

Engage with major global issues at the interface of science, technology, society, and the environment and engage in analytical and strategic thinking through defining the problem, developing possible solutions, and improving designs.

#3

#### CHANGE, CAUSE, AND EFFECT

Identify patterns of cause and effect and make predictions based on these patterns.

#6

#### DESIGN, CONDUCT, AND ANALYZE SCIENCE INVESTIGATIONS

Design investigations that generate data to provide evidence that supports claims they make about phenomena.

# Modified Making Meaning Protocol

As you enjoy this presentation, consider:

- What do you see?
- What questions does this presentation raise for you?
- What strikes you as significant?
- What are the implications for our work?



# Curriculum: Standards and Performance Indicators\*

## Aligned to Next Generation Science Standards

1. **Science Concepts:** Make connections showing how the concepts of matter and energy; change, cause, and effect; and structure and function can be observed across the science domains.
2. **Scientific Practices:** Design investigations that generate data to provide evidence that supports claims they make about phenomena.
3. **Engineering:** Engage in an iterative cycle of design to develop solutions to human problems.

SCIENTIFIC INQUIRY AND KNOWLEDGE	
PBGR	
Standard 1: Science Concepts	
	Make connections showing how the concepts of matter and energy; change, cause and effect; and structure and function can be observed across the science domains.
	<b>Performance Indicators:</b>
a.	Structure and Function: Provide examples showing ways in which the substructure of an object or living thing determines many of its properties and functions.
b.	Structure and Function: Make connections and/or represent with models showing how the substructure of an object or living thing determines many of its properties or functions.
c.	Matter and Energy: Demonstrate understanding through the use of evidence to show interactions between matter and energy in a system, including the concepts of conservation of mass and energy.
d.	Change, Cause, and Effect: Use evidence to explain how changes to factors in systems affect the balance within the system, including how changes can affect the sustainability of Earth's systems.
Standard 2: Scientific Practices	
	Design investigations that generate data to provide evidence that supports claims they make about phenomena.
	<b>Performance Indicators:</b>
a.	Design Scientific Investigations: Plan a scientific investigation through questioning, identifying variables, developing hypotheses based on research, and creating a procedure for collecting data.

# Next Generation Science Standards (NGSS)\*

- Scientific Practices
  - E.g., Asking questions and defining problems, developing and using models, planning and carrying out investigations, analyzing and interpreting data, using mathematics and computational thinking
- Crosscutting Concepts
  - E.g., Patterns, cause and effect, systems and system models, energy and matter, structure and function, stability and change
- Disciplinary Core Ideas
  - E.g., Structure and properties of matter, chemical reactions, nuclear processes, forces and motion, types of interactions, definitions of energy, conservation of energy and energy transfer



\*NGSS adopted by VT AOE in 2013



# Curriculum Updates

- K-6 Curriculum Maps
- 7-8 Curriculum Maps
- 9-12 Pathways and Syllabi

7th Grade						
When	Focus Question	Unit	Standard & PI	Score Guides	Activities	Resources
Q1	How do living and nonliving things interact in an ecosystem?  What do foresters do?	<b>Forestry Study:</b> Populations in ecosystems shift based on changes in biotic and abiotic factors.	<b>Standard 2. Scientific Practices</b> - Design investigations that generate data to provide evidence that supports claims they make about phenomena. a. <b>Design Scientific Investigations</b> - Plan a scientific investigation through questioning, identifying variables, developing hypotheses, and creating a procedure for collecting data. b. <b>Conduct Scientific Investigations</b> - Carry out an investigation using the correct tools, measurements, and/or other methods of data collection to collect and record useful data. c. <b>Analyze Data</b> - Develop conclusions based on data, describe flaws in data and identify errors in the investigation.	<a href="#">Science Concepts</a>  <a href="#">S2: Scientific Practices Descriptors</a>  <a href="#">Forestry Investigation Score Guide</a>	Project Based: <a href="#">Inspires Intro Letter</a>  Students develop an  Forestry Data <ul style="list-style-type: none"> <li>Counting Trees</li> <li>Making Sample Plots</li> <li>DBH</li> <li>Tree Height</li> <li>Elevation</li> <li>Tree Type (deciduous/coniferous)</li> </ul> In collaboration w/Math <ul style="list-style-type: none"> <li>Sets of data</li> <li>Graphing</li> </ul> Data Analysis <ul style="list-style-type: none"> <li><a href="#">CODAP</a></li> <li><a href="#">CER &amp; Variables Quiz</a> (Modified version <a href="#">here</a>)</li> <li><a href="#">Levelled Questions</a></li> </ul>	<a href="#">Slideshow</a>  <a href="#">Folder</a>  <a href="#">Chaperone Handout</a>  <a href="#">Spruce Mountain Data Stops</a>  <a href="#">Expert Day Folder</a> <ul style="list-style-type: none"> <li>Contacts</li> </ul> <a href="#">Bulletin Board Printouts</a>

## K-6 UNITS AT-A-GLANCE

Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6
Living Things and Their Needs  Forces: Pushes and Pulls  Intro to Weather	Intro to Sun, Moon, and Stars  Light and Sound  Exploring Organisms	Intro to Matter  Earth Materials  Ecosystem Diversity	Life in Ecosystems  Forces and Interactions  Weather and Climate Patterns	Changing Earth  Energy Works  Plant and Animal Structures	Matter and Energy in Ecosystems  Earth and Space Systems 1  Structure and Properties of Matter	Weather and Climate Systems  Earth and Space Systems 2  Energy Forces and Motion



Grade K/1st: Left: Integrating math and science as students observe nature and compare lengths using non-standard measurement tools. Right: Noticing that trees had dropped their leaves along with older buddies.





Grades 3 and 4: Left: Final experiment on aluminum foil boats as part of engineering task. Right: Students learning the parts of a flower that are needed to form a seed as part of pollination unit.





Grade 6: Using microscopes to examine structure and function.

# Instruction: Middle School Example

## *How do engineers define problems?*

### Learning Goals:

- I can read for facts and clues.
- I can ask questions that will help me to better understand the problem that needs to be solved.

### Agenda: Wednesday, Sept 23

1. We are starting a new unit today!
2. Read Aloud together - [Woolly Mammoth Calf](#)
3. **Read** Problem Statement, **Identify** Questions, and **Summarize** Problem
4. List need to knows

**Homework:** Finish class work.





# Instruction: High School Examples





# Instruction: High School Examples

Name: \_\_\_\_\_

Environmental Horticulture

Engineering Design Challenge-1

In this activity, you will be introduced to the steps involved in the engineering design process by working to solve a problem.

**Problem in need of Engineering Design:** \_\_\_\_\_

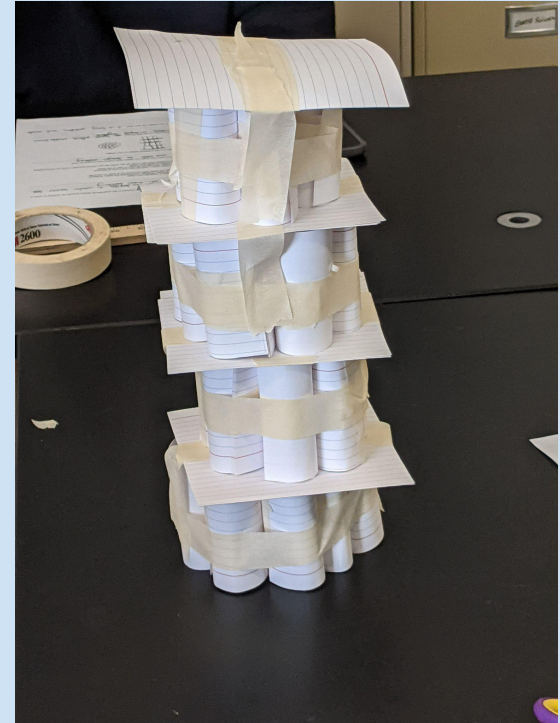
\_\_\_\_\_

## Criteria

1. You will work in groups to engineer your tower.
2. The tower must be at least 1 foot tall, not including the water container.
3. Your tower must hold the water-filled container for at least 10 seconds.

## Constraints

1. You will have 100 index cards, masking tape and a pair of scissors.
  2. The scissors and meter stick cannot be used as part of the tower.
  3. You will have 20 minutes to build your tower.
  4. You can hold the container filled with water as you build, but you cannot *test* with it until the official testing time begins.
- 
1. Based on the above lists, how might you define what criteria and constraints are?





# VT Comprehensive Assessment Program (VTCAP)

- Fully aligned with Next Generation Science Standards
- Replaced Vermont Science Assessment (VTSA)
- Administered in Spring 2023
- Administered to students in Grades 5, 8, and 11
- Administered via computer
- Approximately 2 hours long
- The scores are still embargoed.

# Vermont Science Assessment (VTSA)

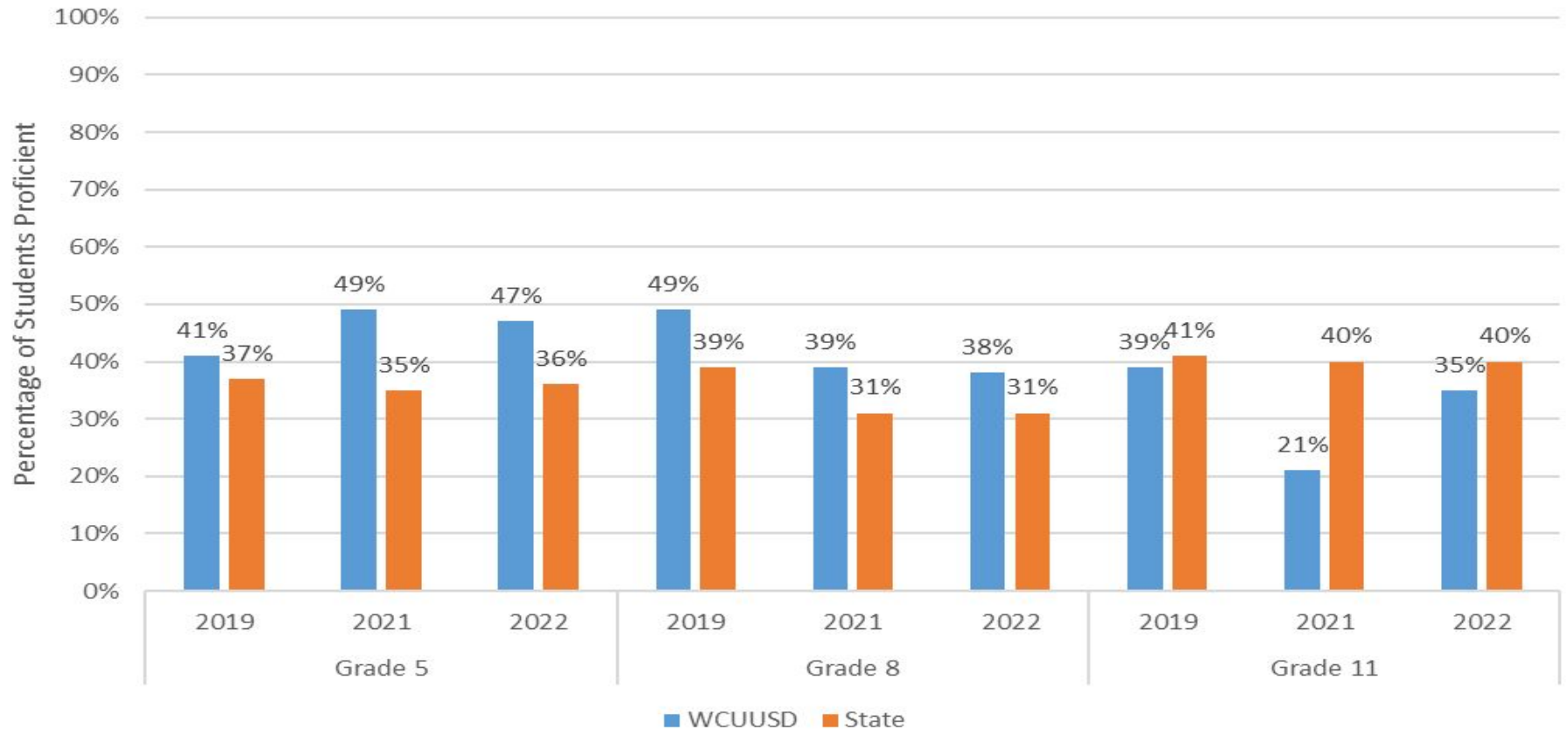
- Fully aligned with Next Generation Science Standards
- Replaced New England Common Assessment Program (NECAP)
- Field-tested in May 2018
- Administered in May 2019, May 2021, and May 2022
- Administered to students in Grades 5, 8, and 11
- Administered via computer
- Approximately 2 hours long

# Analysis of Data

- We have fewer sources of data to analyze regarding our students' performance in science.
- The results on the VTSA indicate significant differences in performance between student sub-groups related to free and reduced lunch and individualized education plans.
- We will analyze the VTCAP Science results once they are no longer embargoed.
- The ways in which we configure grade levels impacts our practices in science.
- We have included report card and PBGR data.

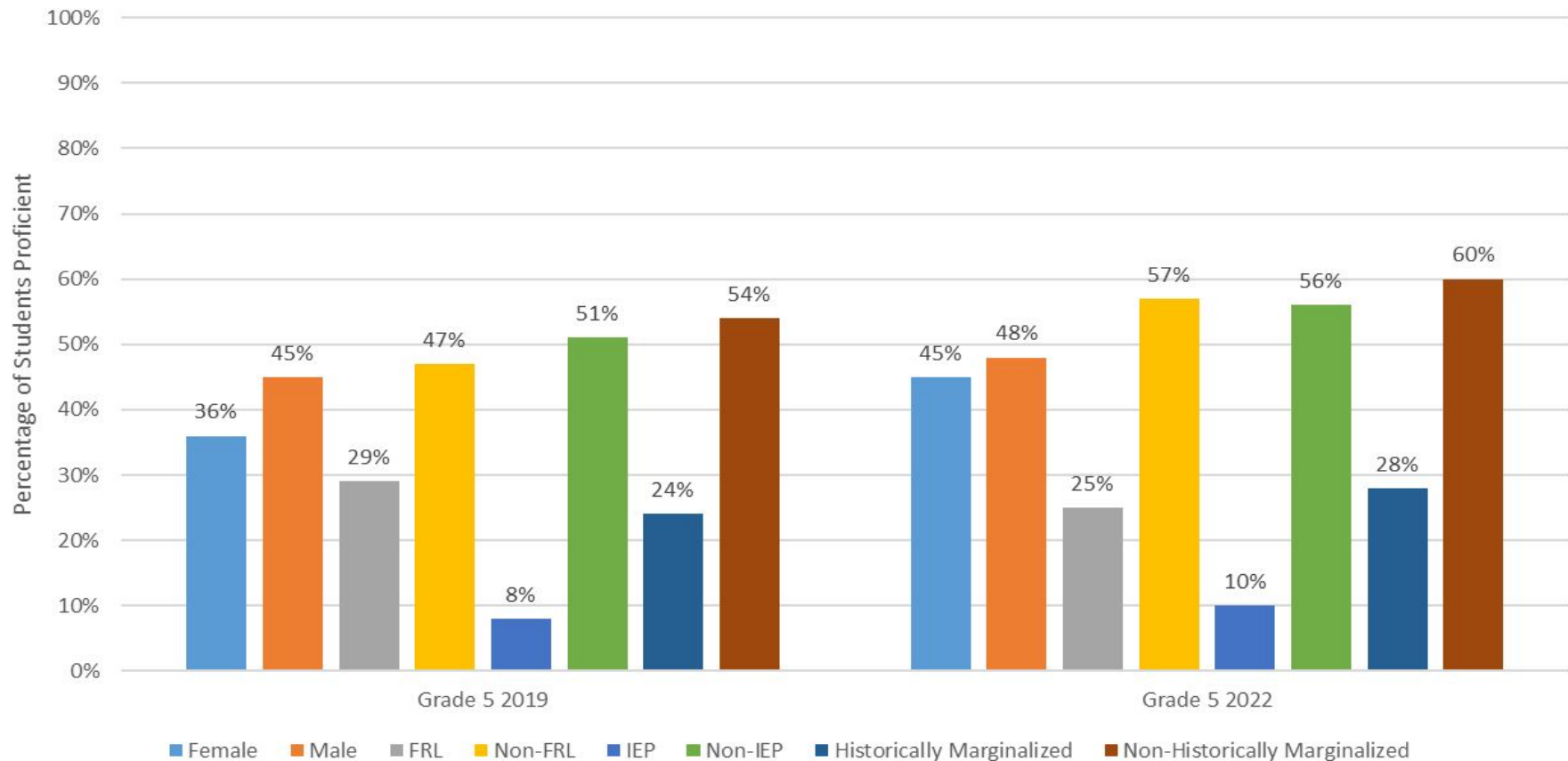
# VTSA Comparison to State, 2019, 2021 and 2022

## Grade 5, Grade 8, and Grade 11



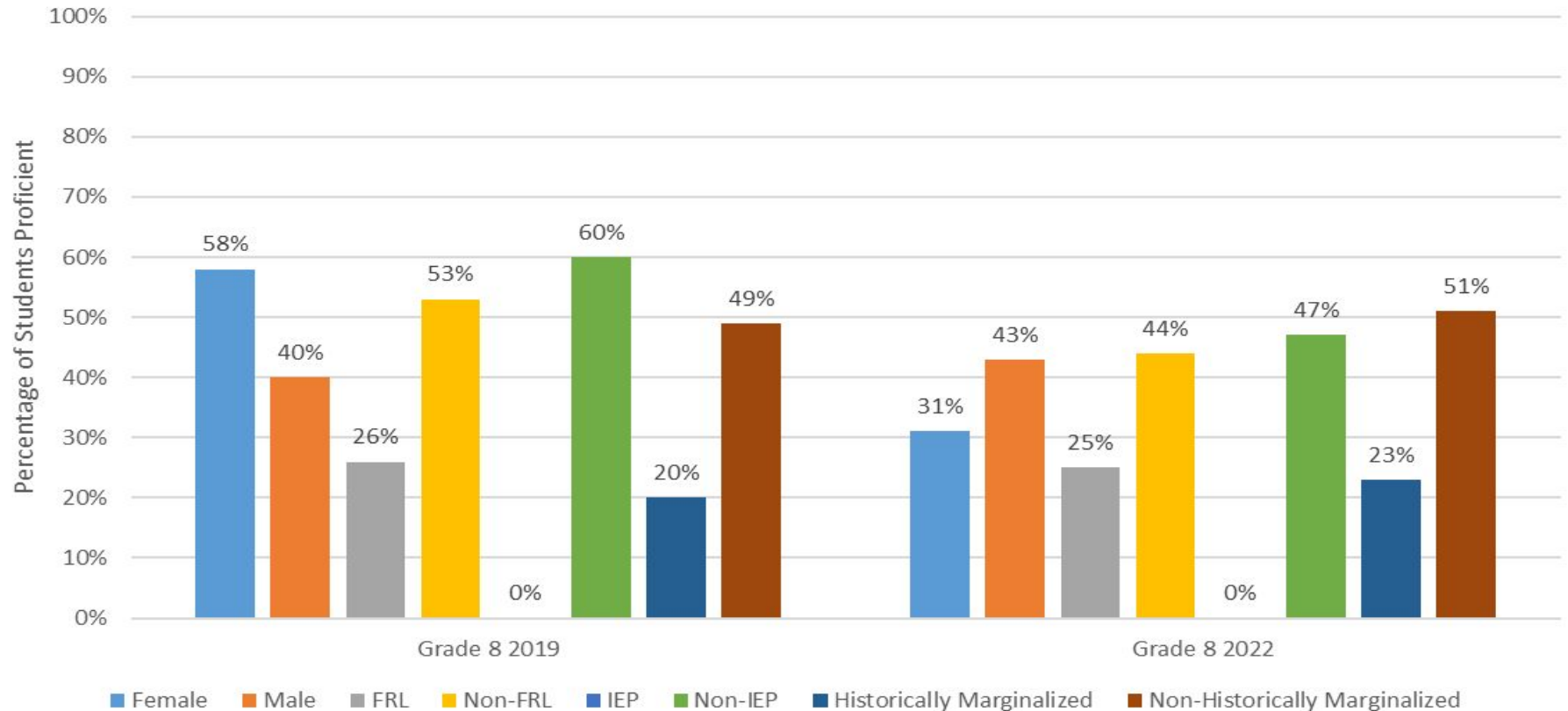
# WCUUSD VTSA Disaggregated Results, 2019 and 2022

## Grade 5



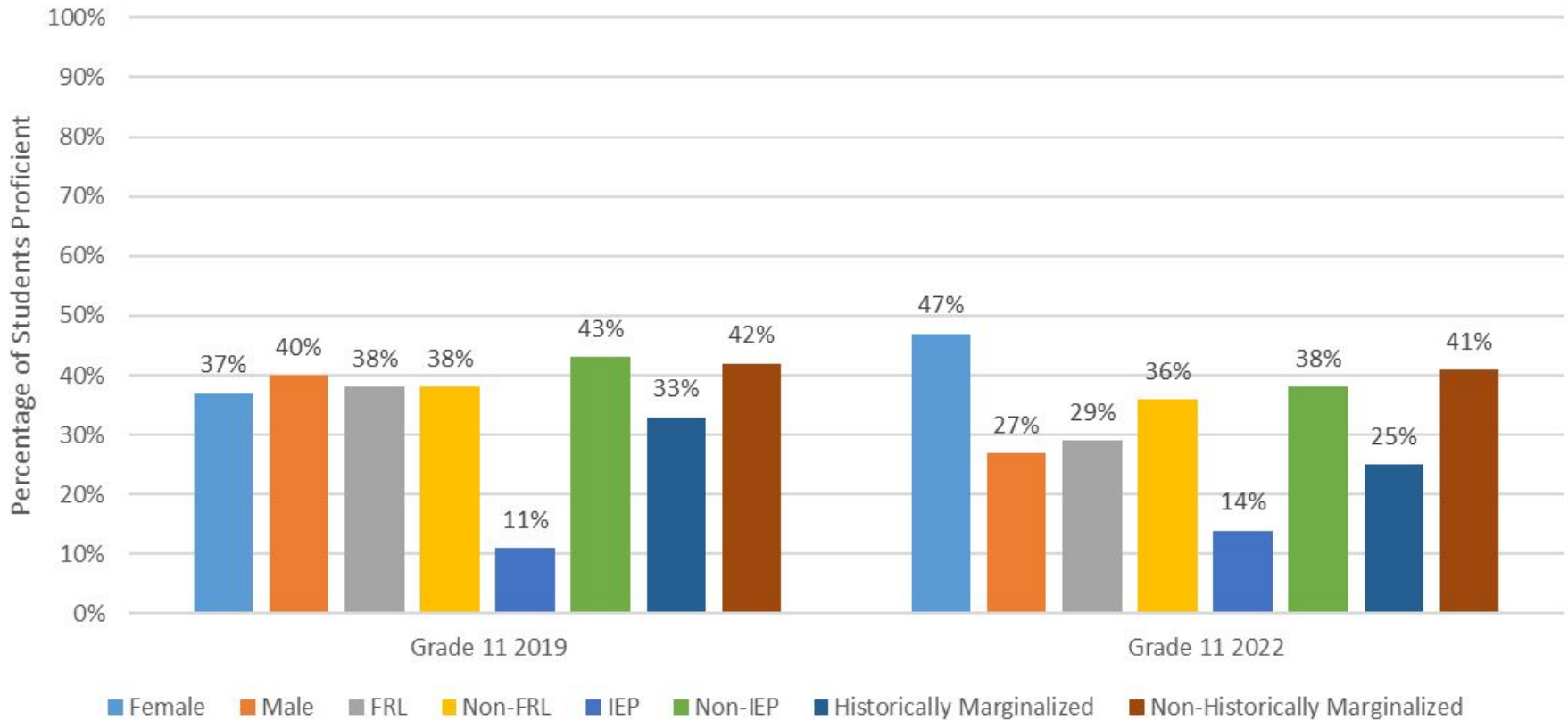
# WCUUSD VTSA Disaggregated Results, 2019 and 2022

## Grade 8



# WCUUSD VTSA Disaggregated Results, 2019 and 2022

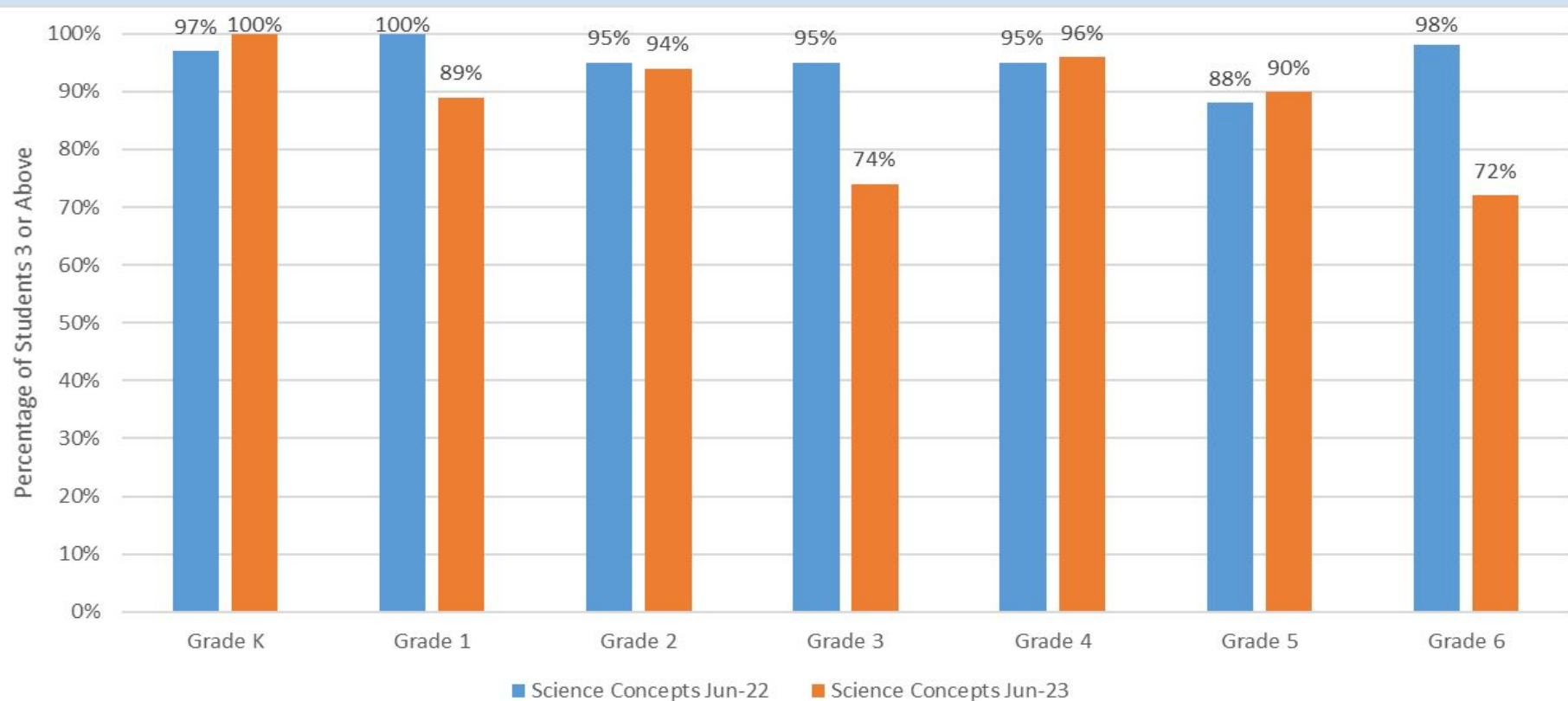
## Grade 11





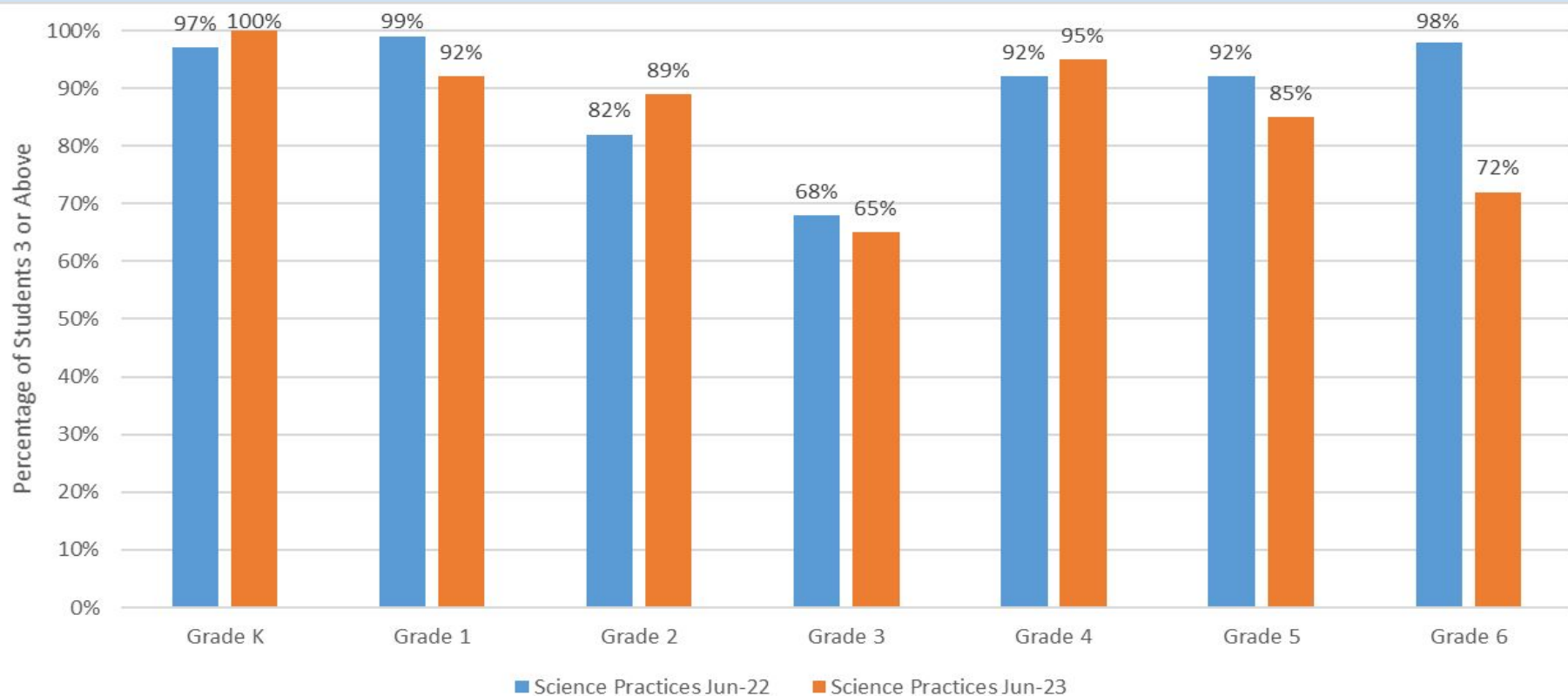
# WCUUSD Elementary Report Card Data

## June 2022 and 2023



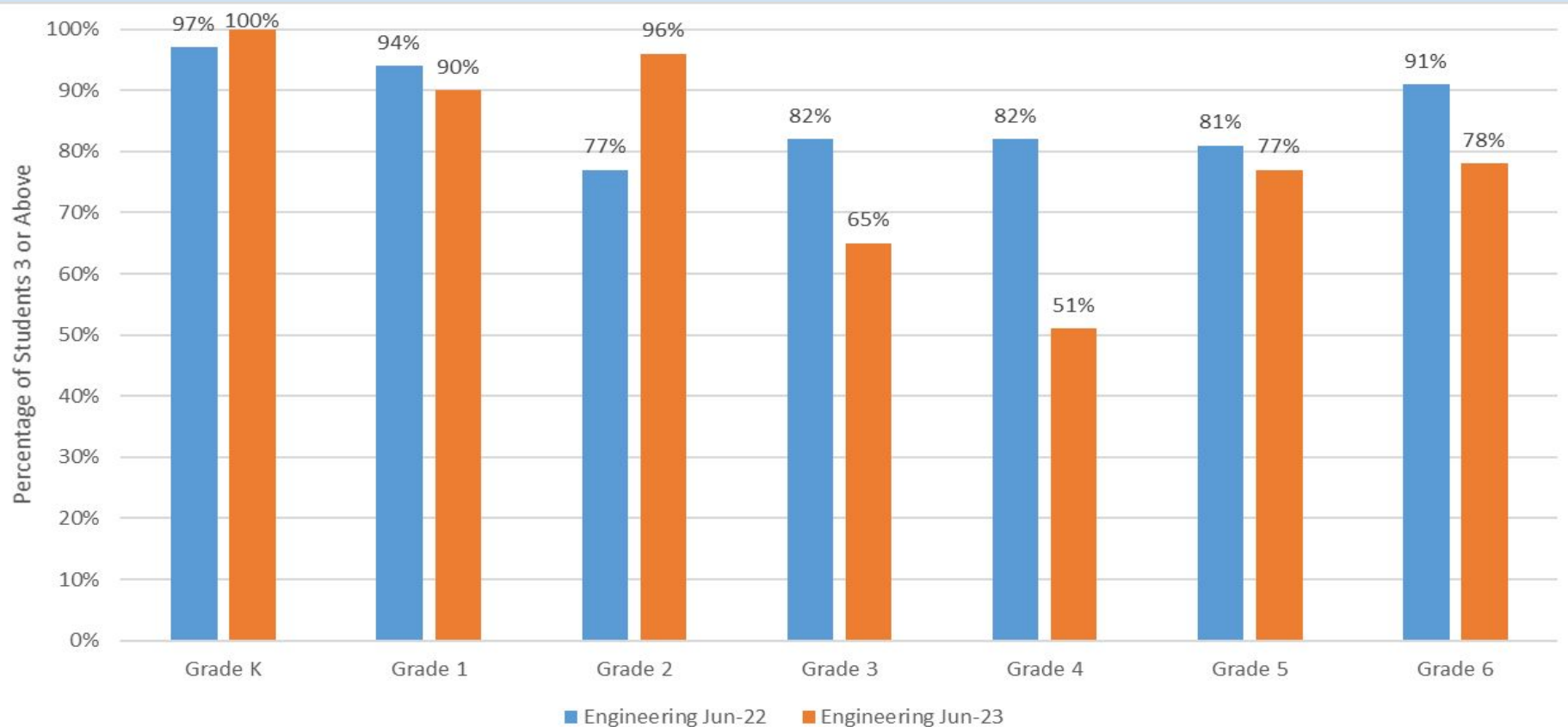
# WCUUSD Elementary Report Card Data

## June 2022 and 2023



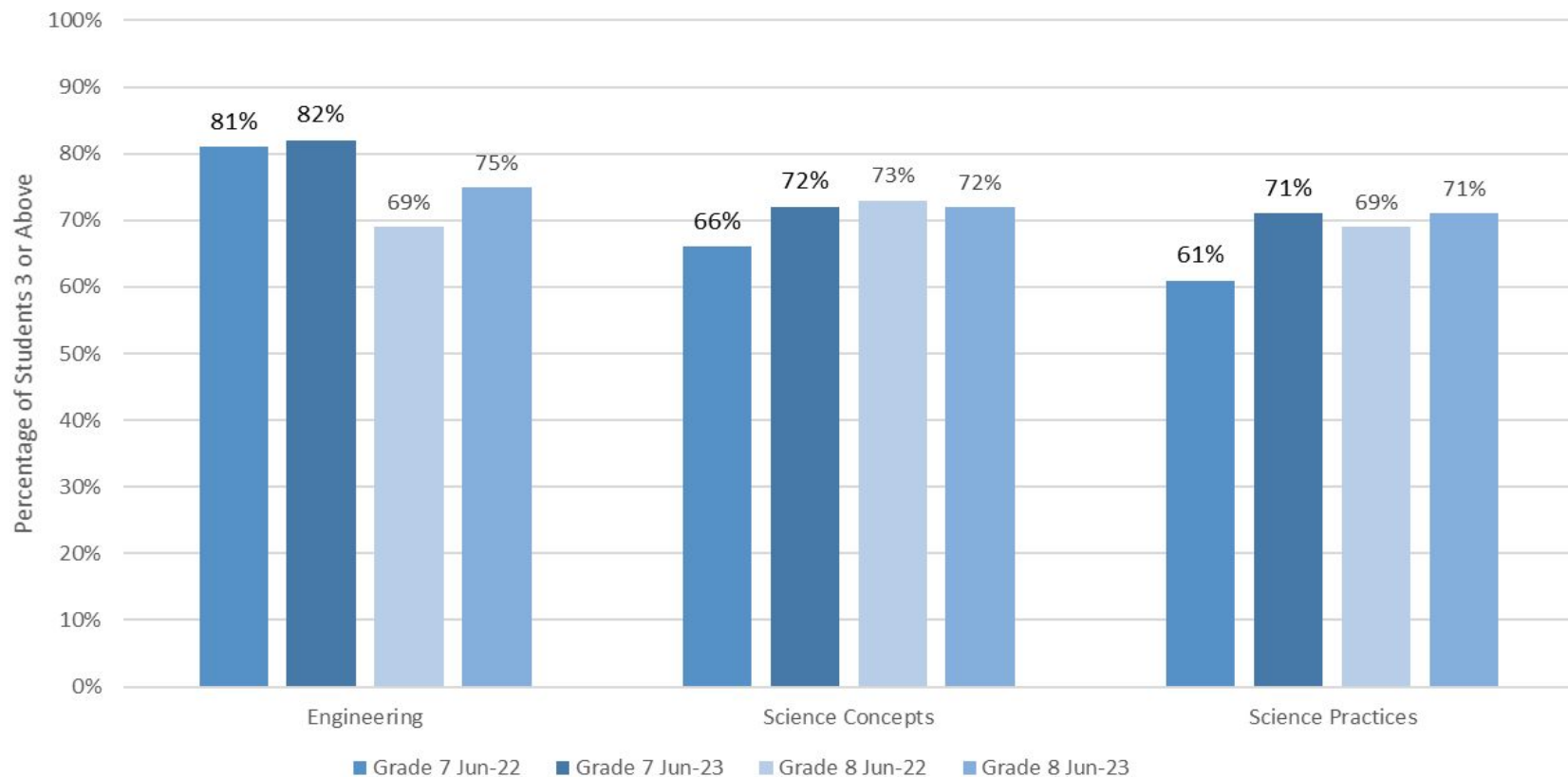
# WCUUSD Elementary Report Card Data

## June 2022 and 2023



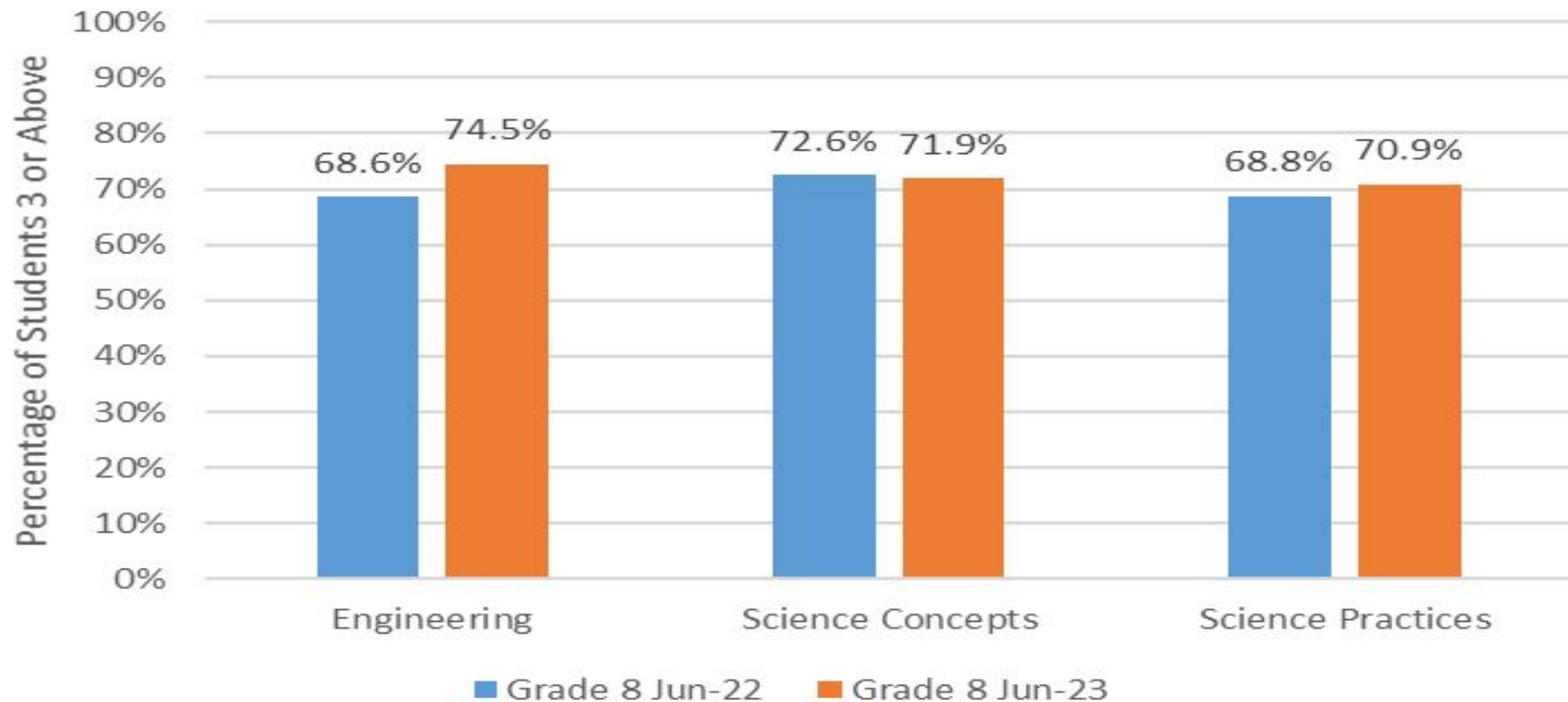
# WCUUSD Middle School Report Card Data

## June 2022 and 2023

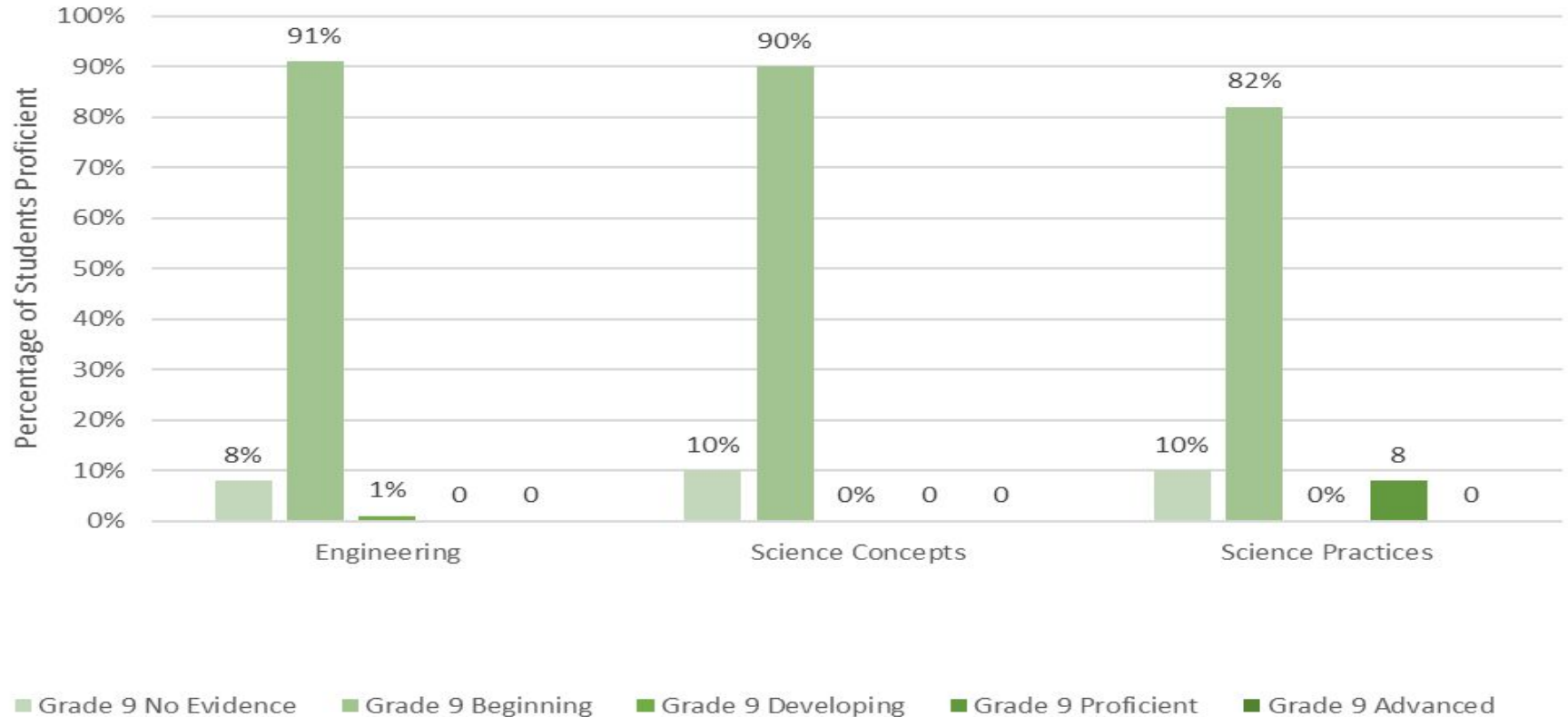


# WCUUSD Middle School Report Card Data

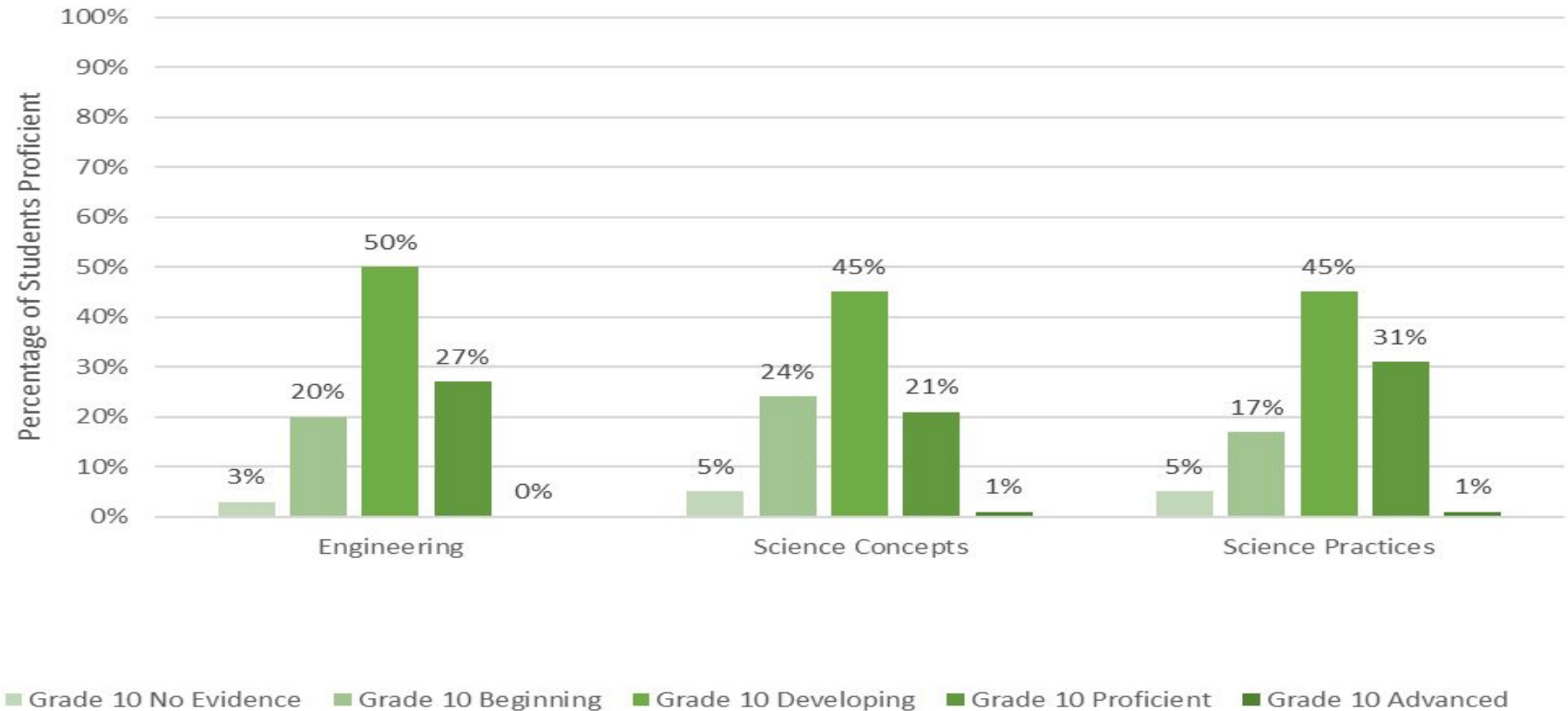
## June 2022 and 2023



# Assessment Data: PBGR's for Current Grade 10 June 2023 (End of 9th Grade)

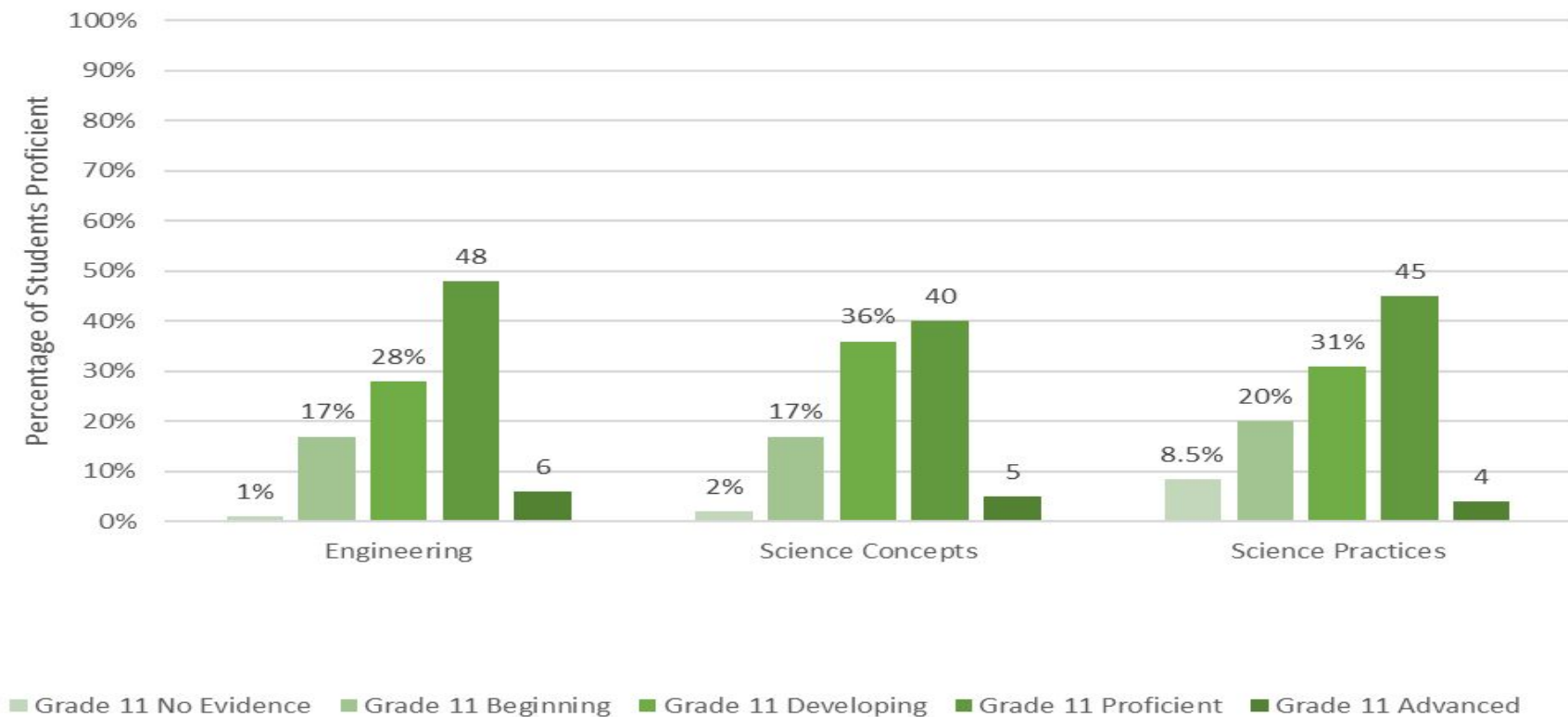


# Assessment Data: PBGR's for Current Grade 11 June 2023 (End of 10th Grade)





# Assessment Data: PBGR's for Current Grade 12 June 2023 (End of 11th Grade)





# Celebrating Our Students

2023 High School Award Recipients:

- U-32 Science Recognition: Maya Elliott, Cara Richardson, Jack Thompson, Logan Wood
- Society of Women Engineers Merit Award: Maya Elliott, Ambiana Glavin, Cara Richardson
- RIT Science and Math Scholarship: Alex Weller
- RIT Women in STEM: Olivia Serrano

# School Board Role

- Support for continued professional learning
- Considerations regarding:
  - Instructional time
  - Statewide testing
  - Flexible pathways
- What else?

## STUDENT LEARNING OUTCOMES



WCSU exists to nurture and inspire in all students the passion, creativity, and power to contribute to their local and global communities.



### SCIENTIFIC INQUIRY AND CONTENT

#1

#### STRUCTURE AND FUNCTION

Understand that the ways in which an object or living thing is shaped and its substructure determine many of its properties and functions.

#4

#### SUSTAINABILITY

Understand that humans' impacts are greater than they have ever been, as are humans' abilities to model, predict, and manage current and future impacts in order to maintain human societies and the biodiversity that sustains them.

#2

#### MATTER AND ENERGY

Demonstrate understanding of the interactions between matter and energy in a system including the concepts of conservation of mass and energy.

#5

#### ENGINEERING

Engage with major global issues at the interface of science, technology, society, and the environment and engage in analytical and strategic thinking through defining the problem, developing possible solutions, and improving designs.

#3

#### CHANGE, CAUSE, AND EFFECT

Identify patterns of cause and effect and make predictions based on these patterns.

#6

#### DESIGN, CONDUCT, AND ANALYZE SCIENCE INVESTIGATIONS

Design investigations that generate data to provide evidence that supports claims they make about phenomena.

# Modified Making Meaning Protocol

- What did you see?
- What questions did this presentation raise for you?
- What struck you as significant?
- What are the implications for our work?
- What does the full school board need to know about this work?