



Quail Summit Elementary School

Project Name:

Promote Energy Efficiency & Foster Awareness on Sustainability

Advisor: Mrs. June Han

Project summary

The sustainability team at Quail Summit Elementary School engaged students to identify opportunities to improve energy efficiency and reduce carbon dioxide emissions on campus.

In particular, the team focused on three efforts: 1) inefficient electricity usage, 2) studies on solar energy, and 3) carbon dioxide emissions reduction. We not only proposed solutions to address some of the energy issues we identified, but also conducted research and analyses to better understand the potential of solar energy for our school.

Our Project Aims to Achieve Three Main Goals

- I. Engage students to identify energy inefficiencies on campus and propose solutions.
- II. Research solar energy and conduct analysis to quantify its benefits for Quail Summit.
- III. Identify sources of carbon dioxide emissions on campus and develop actionable solutions to reduce carbon dioxide emissions on campus.

Existing Practices of Sustainability At Our School

- ▶ Quail Summit has always been sustainability oriented with many successful practices to ensure a good learning environment, such as:
 - ▶ Using energy-efficient lighting and equipment.
 - ▶ Establishing multiple procedures to conserve energy.
 - ▶ Encouraging students to throw trash in the right receptacle.



Drive Awareness & Student Engagement

- ▶ The sustainability team (lead: Amy Xu, members: Carissa Ip, Blaire Li) worked with their advisor, Mrs. June Han, to further identify potential opportunities to make Quail Summit a more energy efficient place for current and future students.
- ▶ The sustainability team acknowledges the importance of student participation and the value of fostering sustainability mindset among the student body and conducts various activities.
- ▶ The team made and placed boxes in classrooms to collect ideas on energy related sustainability opportunities from the students.

Opportunity Identified on Electricity Usage

- ▶ The team consolidated ideas collected from the student body and the observations from the team and identified that electricity usage could be a great source of saving energy.
- ▶ Key observations include: 1) Lights often remained on even when no one was around; 2) A/C is often too turned too low during summer.



Research Conducted to Understand the Significance of the Issue

- ▶ The team then conducted some online research on the energy efficiency for K-12 schools.
 - ▶ Lighting is one of the largest factors of energy consumption in schools. According to the Alliance to Save Energy, “lighting accounts for nearly 50% of the electric bill in most schools.”
 - ▶ According to data from the U.S. Energy Information Administration (EIA), K-12 schools in America annually spend an average of \$0.67 per square foot on electricity a year.



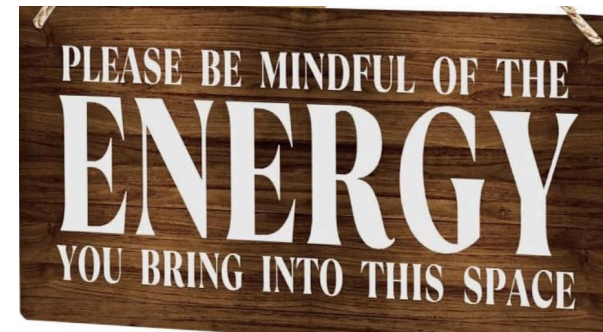
Data Collection of Lighting Inefficiency

- ▶ To better understand the significance of lighting inefficiency at our school, we gathered the data through observations over a 5-day period.

	Monday	Tuesday	Wednesday	Thursday	Friday
# Empty Rooms with Lights on	6 Rooms & Library	Library	3 Rooms	Library	4 Rooms
Time of the Day	Lunch & Recess	Lunch	Lunch	Afternoon	Lunch & Recess
Duration of Inefficient Usage	~70 mins	~50 mins	~40 mins	~30 mins	~30 mins

Energy Saving Opportunities

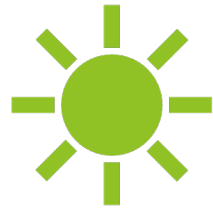
- ▶ The sustainability team worked with the students to develop electricity saving opportunities
 - ▶ Put up “save energy” signs.
 - ▶ Install motion sensor lights or turn off lights when not in use.
 - ▶ Refine the A/C temperature setting to reflect daily natural temperature fluctuation.
 - ▶ Close doors and windows when possible.
 - ▶ Turn off computer equipment when not used.



An Independent Study on Solar Energy



During the process of identifying energy saving opportunities, the sustainability team developed a big interest in alternative energies.



Considering that Quail Summit Elementary School is based in sunny Southern California with ample sunlight during the day, the team focused on solar energy.



An Independent Study on Solar Energy

- ▶ After having studied the Schools Going Solar document in the NEED curriculum, the team learned that schools make an excellent showcase for the benefits of solar photovoltaic electricity, solar thermal energy, and passive solar design.
- ▶ The solar system also leads to great environmental benefits, including offsetting carbon dioxide produced by traditional power plants and vehicles.
- ▶ Meanwhile, the schools also get huge benefits from solar energy. For example, a 2-kilowatt (kW) PV system can produce over 250 kilowatt-hours (kWh) of electricity per month and have an average annual output of more than 3,000 kWh.



Schools Going Solar
Data driven lessons and activities to support and incorporate installed photovoltaic systems into the classroom learning environment.

2019-2020

Grade Levels:

Int Intermediate Sec Secondary

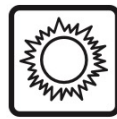
Subject Areas:

Science Social Studies
 Math Language Arts
 Technology

NEED
National Energy Education Development Project

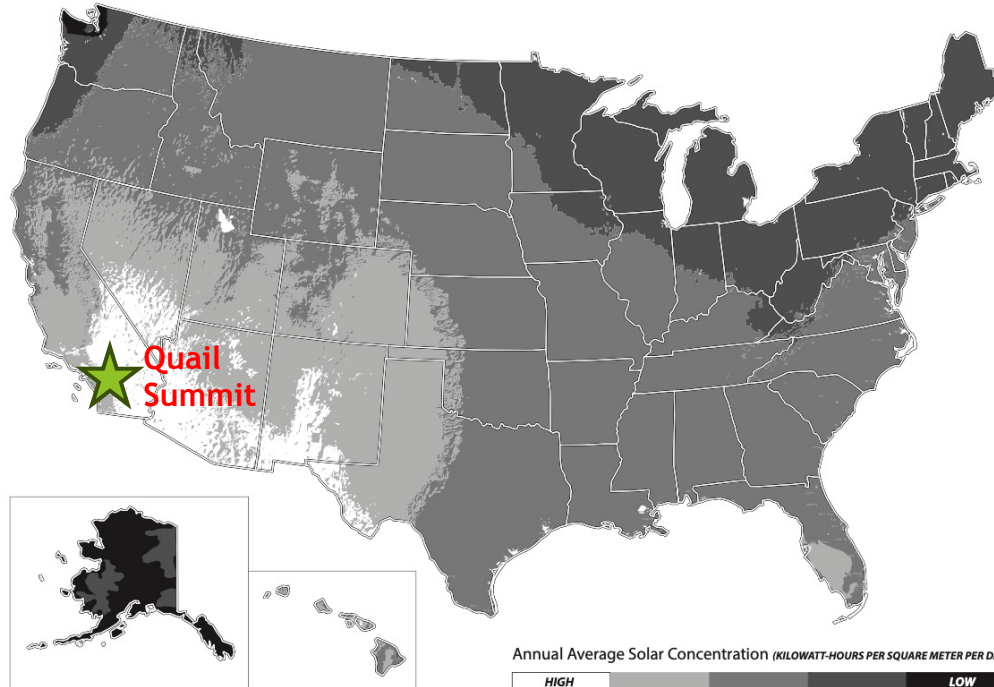
Analysis on Benefits of Solar Energy For Quail Summit

- ▶ According to the U.S. Solar Resources map, Quail Summit is located in the region with a >6kWh per square meter per day.
- ▶ Assuming that PV panels can be installed for 20% of the total size of Quail Summit Elementary School (10K square meters as a whole), the PV system can generate 12,000 kWh per day, which is more than sufficient to sustain the school's regular electricity usage.



U.S. Solar Resource Map

Annual Average Solar Concentration



Note: Alaska and Hawaii not shown to scale
Data: NREL

Further Interest Sparked on Carbon Dioxide Emissions

- ▶ While the team was working on energy saving opportunities, we developed further interest on CO₂ emissions.
- ▶ Carbon dioxide emissions are the primary driver of global climate change.
- ▶ Our research shows that numerous scientific and industry studies proved the needs for de-carbonization in K-12 schools.
- ▶ In particular, schools in the United States release carbon emissions equivalent to 18 coal-fired power plants annually.



The Importance of Decarbonization in K-12 Schools

NOVEMBER 9, 2023 | By Trane

Our Focus on Food Waste at Quail Summit

- ▶ Among the identified key drivers of carbon dioxide emissions, the team believed food waste could be a good focus area to help Quail Summit reduce carbon dioxide emissions.
- ▶ Per a study conducted by the U.S. Environmental Protection Agency and the Kroger Co. Foundation, national food waste in schools could amount to approximately 530,000 tons per year (excluding milk, which was calculated separately).
 - ▶ The study estimated an average of 39.2 pounds of food waste per student yearly.

Proposed Solution: Preserve and Re-distribute Unopened Packaged Food

- ▶ Based on our observations, ~40% of the food waste at Quail Summit is unopened packaged food, which can be preserved and donated to families in need.
- ▶ We consider this as a viable solution because Quail Summit teachers and staff once implemented this approach during COVID, which received good feedback from families in the neighborhood.

Summary & Key Learnings

- ▶ During our exploration concerning energy saving and sustainability for Quail Summit, we identified many actionable and inspirational opportunities.
- ▶ The team successfully engaged with students and raised awareness on the importance of energy efficiency.
- ▶ The team leveraged different resources and conducted analyses to better understand the significance of the identified opportunities.
- ▶ The team also realized the importance and challenges of implementing the solutions and is committed to work with the school administrators and students in the future to ensure a long-lasting impact.