

SENCER-IZING THE HIGH SCHOOL CURRICULUM

ONE UNIT AT A TIME

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Carolina Day School; Asheville, North Carolina



SENCER IDEALS: POWER OF SCIENCE AND MATH; EXTRACT LARGER, COMMON LESSONS ABOUT SCIENTIFIC METHODS

11th/12th Calculus 1
Using Calculus to Analyze Climate Data
Patrick Williams

This year in the Calculus 1 class, students utilized calculus concepts such as rates of change (derivatives), and net change (integrals) to study climate data. Students used several calculus applications to analyze three sets of real-world data. They also used their calculations to critically analyze media stories on climate change.

DATA SET	CALCULUS APPLICATION	CONCEPTS ILLUSTRATED
Sea level CO ₂	Derivatives	Positive rates of change over time. Seasonal rates of change that are both positive and negative.
Sea ice surface area and volume	Integrals/Reimann sums	Daily and yearly sea ice fluctuations. Differences in arctic and Antarctic sea ice fluctuations.
Earth's energy budget/Albedo effect	Derivations of equations	Changing the albedo of certain surfaces can change the temperature of those surfaces to maintain equilibrium.

All three of the projects connect to allow students to better understand climate science, and the handful of data that scientists use to base their claims of "human influenced climate change". They know that more CO₂ means more back radiation, more back radiation means higher temperatures, higher temps means less ice, less ice means lower albedo, and lower albedo means higher temperatures.

SENCER IDEALS: IMMEDIATE USE AND IMMEDIATE INTEREST; PRACTICAL AND ENGAGED

9th/10th Integrated Math 2
Variety of units
Andy Lammers

Ninth and tenth grade students in the Integrated Math 2 course at Carolina Day School investigated problems of interest from a mathematical perspective during the second semester of the 2017-2018 school year. The work that happened during this project is a prototype of a more complete project that will be incorporated next year and beyond.

Students investigated issues such as traffic congestion on the CDS campus, the lack of snow at local ski resorts this winter, rehabilitation of prison inmates to prevent recidivism, the lack of affordable housing in Asheville, and the propensity for golden retrievers to develop cancer.

The rationale was to explore the notion that if one learns to see life through a math lens, one may reach the point where she or he begins to see big, complicated problems in the world as math problems...and to realize that most math problems have solutions.

SENCER IDEAL: CIVIC ENGAGEMENT

10th English: Rhetoric and Composition 2
Protest Analysis: Antigone, Research, and a Podcast
Sue Ellen Sims

The students engaged in a dialogue on protests, defining types, purposes, and eventually determining the essential goals common to all protests. Then they studied the play *Antigone* in light of the aspects of protests. They staged a protest, based on characters and themes from the play and wrote reflections on the emotions and realizations they gained by participating. As a summative experience, students researched and then developed a thesis based podcast on a particular aspect of a specific protest. Their podcasts focused on their own personal narrative, solid research, and included two interviews. The students produced wonderful work marked by personal involvement and interest.



Tenth grade students stage a protest in the school lobby calling for the ouster of Creon for his treatment of the body of Polyneices

SENCER IDEAL: COMPLEX, CAPACIOUS PUBLIC ISSUES

9th Human Biology
Cell Theory and Cancer
Joanne Bartsch

In the freshman course Human Biology, students learned about normal cell metabolism and behavior by studying what happens when cells function abnormally and become cancerous. In lab, students compared normal and cancerous cells under the microscope and related their observations back to the symptoms of cancer. They used gel electrophoresis to diagnose the presence of cancer in a patient. Finally, students related their understanding of the genetics of cancer to the environment by creating and displaying an infographic on an environmental factor possibly linked to the development of cancer. In future years, students may be able to work with the local pediatric cancer center in community service of some kind.

SENCER IDEALS: COMPLEX, CAPACIOUS PUBLIC ISSUES; MULTIDISCIPLINARY ENGAGEMENT

9th Global Studies
Flow: Water Through Time
Nina LaFerla and Prudence Munkittrick

In this unit, 9th grade students investigated the relationship between human culture and water through a study of ancient water myths (Chinese, Native American, Nigerian, and Mayan) and post-industrial experiences. Modern water studies included activities based around water resources and consumption, water as a basic human right, water issues in California and Flint, MI, and the effects of Hurricane Katrina. For their final project, students developed their own myth that compared and contrasted ancient and modern water experiences.

SENCER IDEALS: LIMITS OF SCIENCE; MULTIDISCIPLINARY ENGAGEMENT

10th Rhetoric and Composition 2
Technology and the American Mind
Carl Najdek and Sue Ellen Sims

The first unit for Rhetoric and Composition 2 students began the year with a unit on technology that was designed to answer the essential question "How have recent technological developments influenced the ways that we communicate, feel, and think?". Students read and, in small groups, discussed a variety of resources, including fiction (*Fahrenheit 451*), a short story (*The Machine Stops*), poetry ("pity this busy monster, manunkind"), and nonfiction ("Is Google Making Us Stupid?"). Based on their discussions, students brainstormed thematic ideas for a paper, including:

- The impact of technology and politics
- Relevance of humanity in the future
- Civilization without technology
- Changing societal norms
- Addiction to technology

This activity based on inquiry produced excellent results in student engagement, initial research, and use of evidence in support of argument. Even students who usually are reticent or inclined to listen to or accept others' opinions found themselves defending their position within a small group setting, researching their own ideas, and presenting a concept in the greater class. Additionally, the reasoning students presented on both sides demonstrated critical and analytical thinking.

SENCER IDEALS: PRACTICAL AND ENGAGED FROM THE START; RESPONSIBILITIES AS THE WORK OF THE STUDENT

Product Design
Bee Hotel
Gloria Greene

Each year in the product design class, students identify a problem that needs to be addressed and then design a solution to help solve that problem. This year, because of the specific interest of one class member in current issues surrounding the loss of bees, the students chose to build a bee hotel to attract and protect native and solitary pollinators. As with previous projects, the students followed the steps of good product design – brainstorming, researching, identifying pros and cons, initial sketches, model building, prototype development, final structure and presentation to the community. The bee hotel now sits on the CDS campus.



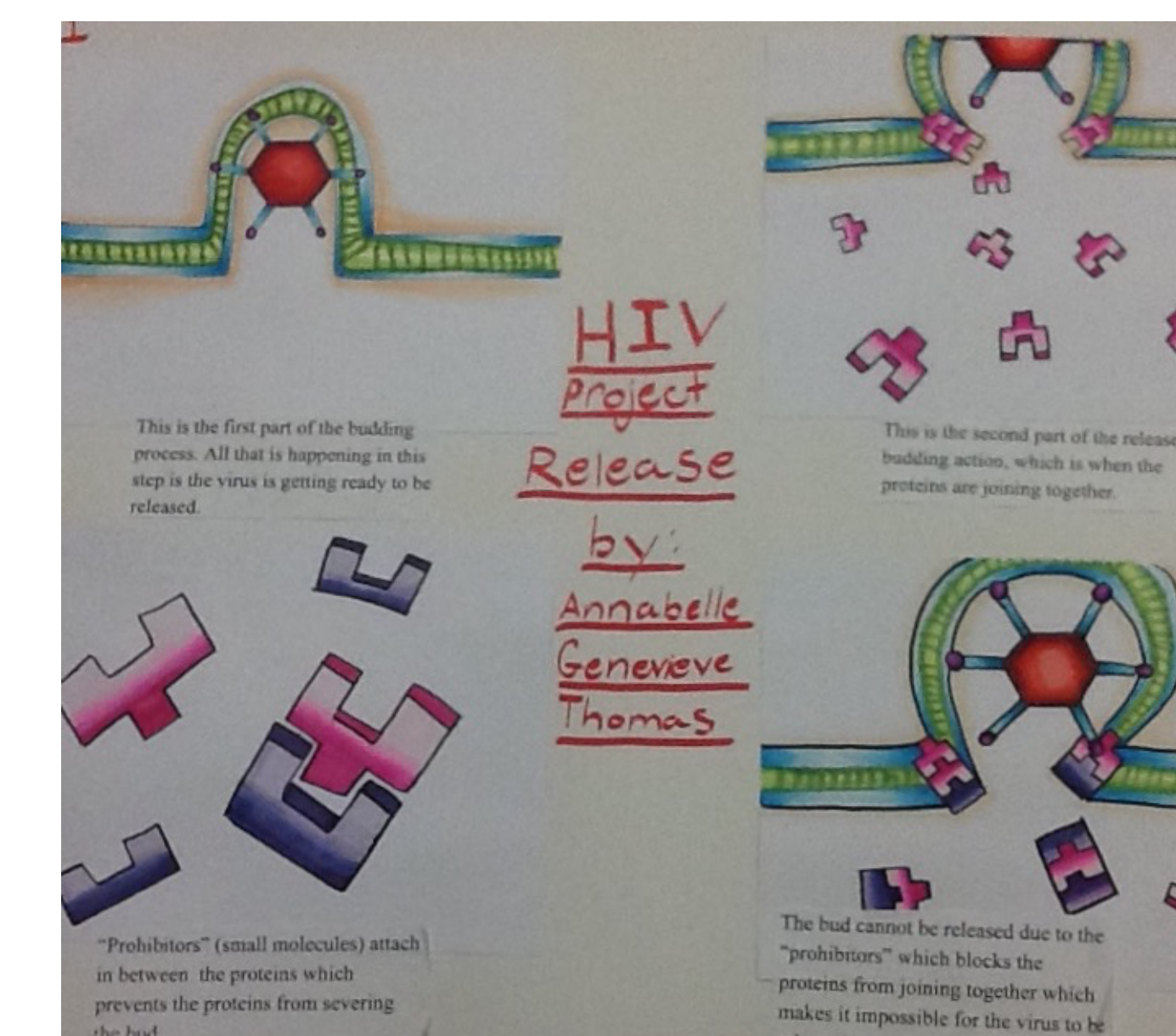
Details of the Carolina Day School bee hotel built by the Product Design Class



SENCER IDEALS: PRACTICAL AND ENGAGED FROM THE START; COMPLEX, CAPACIOUS PUBLIC ISSUES

9th Human Biology
Viral Life Cycles
Joanne Bartsch

As part of their Outbreak! Unit on infectious disease, students learned the basic life cycle of viruses and how that life cycle causes disease in host organisms. However, the students then took their knowledge a step further to see that an understanding of the viral life cycle can also help researchers develop treatments for viral disease. Pairs of students were assigned a specific part of the HIV life cycle (attachment, replication, budding, etc.) and asked to imagine a treatment for HIV/AIDS that was based on that aspect of the life cycle. The students then developed a four-panel display that explained how their newly imagined treatment might work.

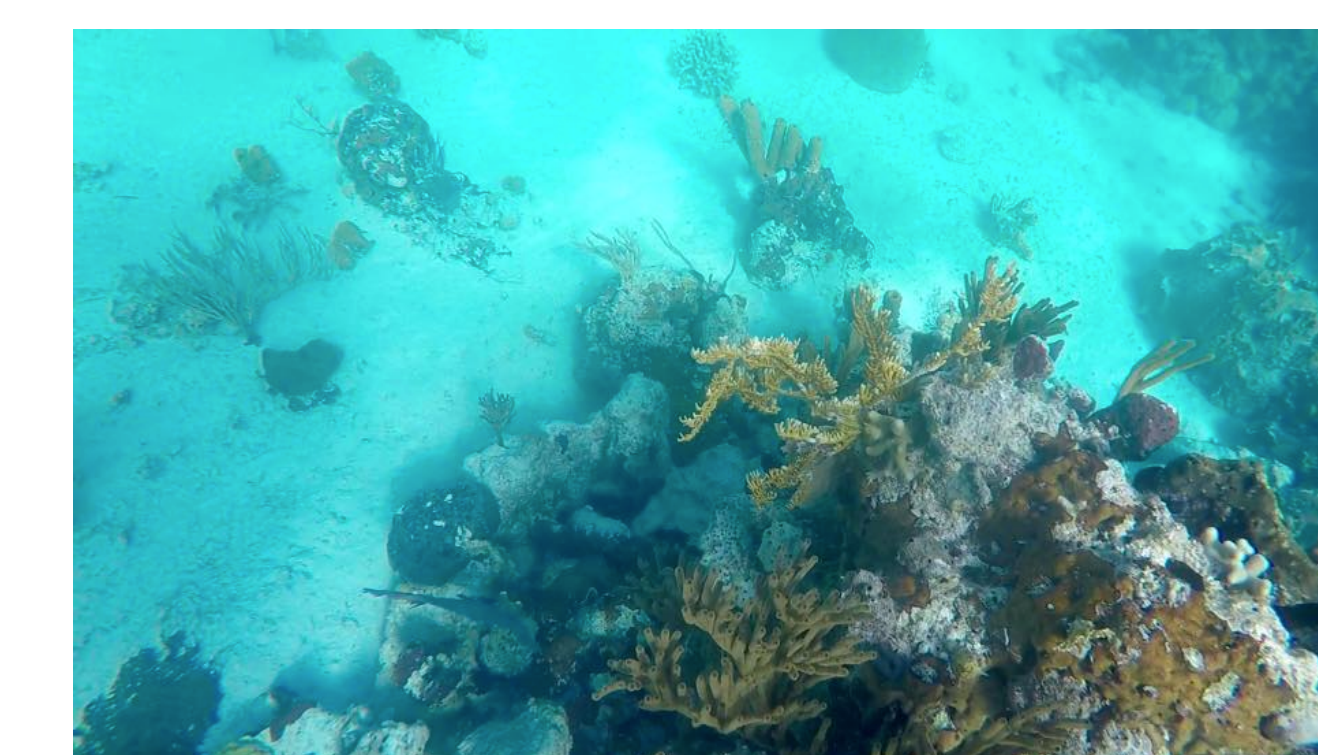


Student imagined treatment for HIV/AIDS based on the Release phase of its life cycle

SENCER IDEALS: PRACTICAL AND ENGAGED FROM THE START; RESPONSIBILITIES OF DISCOVERY AS THE WORK OF THE STUDENT

11th/12th Ocean Studies
Dora Nelson

Students in the Ocean Studies class linked their classroom experience to the real world with a week long sailing trip through the Bahamas. In the classroom, students followed a standard marine science curriculum covering marine life, physical oceanography, coral reef ecology and the evolution and geology of the Bahamas. While sailing, students participated in an intense study of coral reef ecology and collected data about particular species endemic to Bahamian reefs.



Bahamian Coral Reef