Natural Materials & Biomimicry

AP Environmental Science Summer Assignment

AP Environmental Science

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Dear AP Students and Parents:

Welcome to AP Environmental Science! This is a year-long College Board approved course offered to juniors and seniors who wish to learn about the environment and environmental problems around them. The concepts covered in this course coincide with college level environmental science and prepare students for the College Board AP Environmental Science Exam in May. As an AP student, you are expected to read and understand concepts on your own, show initiative, work independently and submit quality work at all times. You are also expected to take the AP Environmental Science exam.

Prerequisites:

- Junior or senior standing.
- Completion of AHC Geology 100 (P) OR Chemistry in the Earth System (P) with a C or better in BOTH semesters.

About Environmental Science:

Environmental Science is an interdisciplinary laboratory science that covers a wide variety of topics included in the study of environmental science. The following themes provide a foundation for the structure of the AP Environmental Science course:

- Science is a process
- Energy conversions underlie all ecological processes
- The Earth itself is one interconnected system
- Humans alter natural systems
- Environmental problems have a cultural and social context
- Human survival depends on developing practices that will achieve sustainable systems

Summer Assignment **Text**

You will be designing and building your own sculpture/structure. This must be an original idea and design. You may be inspired by other artists and artworks, but the design and concept need to be yours. Listed below are some possibilities if you need ideas. Please know, we're using the idea of biomimicry & sustainable buildings/architecture to solve a big problem in urban areas: HEAT ISLANDS

- House
- Building
- Gardens
- Habitat
- New Plant(s)
- Mandala
- Vehicle
- Wreath

Remember, this is environmental science! So….your project should be biodegradeable & decompose over the school year!

We will be using these for a heat island lab the first week of school!

Note: Your project should be no larger than a shoebox and no smaller than a soda can.

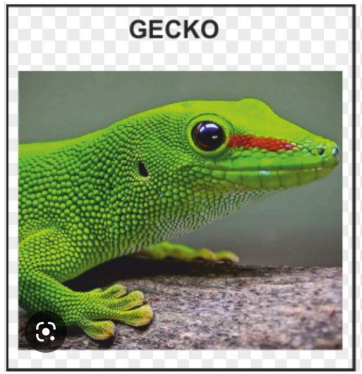
Background Information You May Find Helpful:

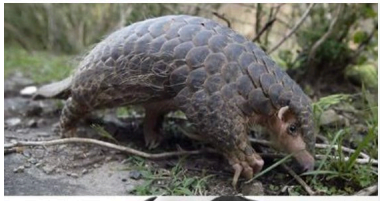
- The next few slides define biomimicry & sustainable buildings.
- They will give you some background information/ideas to give you insight on the direction of this assignment.

Biomimicry in Nature

- Over time, humans have used an approach called biomimicry which uses nature as a model for designs and processes to solve human problems.

- ***Examples***: Velcro, nylon, honeycomb structures for stability, etc.





Architecture & Sustainable Buildings

- Biomimicry can be used in architecture.
- Many societies use biomimicry to build buildings in urban areas to not only lower temperatures of heat islands but to also plant rooftop gardens to help with urban runoff and to feed people living in the area.

Artists & Natural Materials

- The following 6 slides show art made from natural materials by artists.
- ***THINK*** about the questions being asked in each slide. *You do not need to write about them, this is meant to give you ideas.*

Edgian James Florida dresses up his sketches with Malunggay leaves, petals, beans, coconut husk, and other natural materials. Photo from Florida's FB.

Anna Gillsepie

https://www.thisiscolossal.com/2013/02/anna-gillespie/

Look at the face sculpture on the right. If you were to build this sculpture, imagine how you would build it from Scratch. What materials Would you need? How would you attach the acorns?

Daniel Popper- Not made of natural materials, but reflects nature and speaks to it.

https://mymodernmet.com/daniel-popper-morton-arboretum/

Think about: What do you think this artwork is about? What does it represent to you? Why would the artist make it on such a large scale? Would it have the same impact or meaning if it were smaller?

Patrick Dougherty

https://youtu.be/Jiwn9rTHvL4

http://www.stickwork.net/

Questions- How would you feel

About this, knowing that it will

Biodegrade and fall apart?

How does it change the work,

Knowing that it was built by a

Community of volunteers?

How long could someone live in it?

Raku Inoue-

Relief Sculptures of Insects made from natural materials.

https://www.theguardian.com/artanddesign/gallery/2018/aug/11/a-garden-alive-with-art-all-natural-insect-sculptures-in-pictures

https://youtu.be/oW804tc_wm4

Question- How do you feel about the sculptures not being able to be permanent? What does it mean that these sculptures will biodegrade sooner than other artworks? Does it change the meaning or worth?

Matt Tommey- Baskets and Organic Sculpture

http://www.matttommey.com/woven-sculpture.html

Question- These are functional baskets made with old and traditional basketry techniques, that also serve as art pieces. Does it change the meaning if the work is functional? Does it change the meaning if they are functional but used as decorative only?

Susan Benarcik

http://susanbenarcik.com/

Question- How different would these sculptures be if they were in a museum building instead of in the trees? Would it change the meaning? What if they were made of wire instead?

Could you see these sculptures in an invention using biomimicry?

Design- On a piece of printer paper, answer the following questions as you plan out your design. Then sketch your design. (You will be turning this in with your project!)

What do you want to make?

How does it relate to natural materials?

Does this take the idea of biomimicry into consideration?

When you make your design from natural materials, could it solve the idea of heat islands in urban areas??

Does it have a message or symbolize something?

What materials will you need?

Collecting Materials

Grab a bag or basket and head outside. Look down, look up, look everywhere for materials.

Look for things that will not decompose as easily like:

Sticks

Pinecones

Acorns

Seeds

Nuts

Rocks

Feathers

Moss

Building an Armature

An armature is the skeleton of the sculpture. Think of it like the bones or the structure. Your armature may be made of natural materials or it may be made of other materials. Other materials may include:

- Newspaper
- Tape
- Bottles
- Paper towel tubes
- Foil
- Glue
- Wood
- Wood
- Wire
- Chicken Wire
- Cardboard
- Egg Cartons
- Aluminum Cans
- Popsicle Sticks

How to build the armature.

If you are building an armature from natural materials, you will need to problem solve on how to build and what pieces you will build with. Think about the artists that we have looked at and how they built their sculptures.

If you are building using a variety of materials, watch the tutorials below to give you some ideas on how and what to build with.

Newspaper and cardboard are great materials for making the armature!

Watch the first 2 minutes of this video on recycled materials armature- https://youtu.be/94gFQosTx_I

Paper Mache Dragon Armature- https://youtu.be/fFseDAvtDT4

Cardboard Face Armature- https://youtu.be/O-uSe9emca8

Attaching Natural Materials

Trying a variety of different glues to glue your natural materials together is helpful.

Here are some that we used.

White Glue (Not Washable)- Regular White glue, like Elmers works great all around. Be sure to not use the washable glue, it's just not as strong.

Wood Glue is excellent for gluing wood and other natural materials! Its thicker and will hold stronger and faster than white glue if available.

Tacky Glue is similar to wood glue in that its much thicker and will hold faster.

Hot Glue- There are 2 kinds of hot glue, high temperature and low temperature. High temperature works much better because it melts hotter and is able to grab more surface area. I never use low temperature glue any longer because it just doesn’t hold the same.

Possible Ideas Using Natural Materials

The following are examples of student work.

You may take inspiration from them but please do not copy them. You need to use your own great, original ideas!

Remember—we will be using the idea of biomimicry in nature, architecture and sustainable buildings to engineer and build something to help with urban heat islands. We will be testing these the first week of school! Have FUN with this summer assignment!

Student Self Reflection

1. **What do you love about your sculpture?**

2. **What would you change if you were to rebuild or redesign your sculpture?**

3. **What did you learn while building your sculpture?**

4. **What are you most proud of?**

5. **Has doing this assignment changed your thinking about buildings in urban areas?**