The State of Ag

**Description**

There is a large need currently in agriculture for new ideas, engineering and designing better equipment, developing nutrient-efficient crops and sustainable practices to support a growing population. Throughout the semester, students will travel to several tour sites, gathering information about the various components of agriculture, horticulture and the technological advancements that make it all possible. Students will then have the opportunity to design a final product based on the needs, ideas, or environmental concerns that they observe throughout their experience.

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**Introduction**

Throughout my years of teaching, I have encountered a large number of students who have an extremely limited understanding of the just how agriculture impacts their everyday lives. When students are asked to describe what they envision when they think of the word agriculture, they often describe a very outdated idea. Creating a project that will not only allow them to reinvent those ideas but give them first hand experiences, will give students a completely different perspective but may also broaden their career choices. There is a large need currently in agriculture for new ideas, engineering and designing better equipment, developing nutrient-efficient crops and sustainable practices to support a growing population. Throughout the semester, students will travel to several tour sites, gathering information about the various components of agriculture, horticulture and the technological advancements that make it all possible. Students will then have the opportunity to design a final product based on the needs, ideas, or environmental concerns that they observe throughout their experience.

**Curriculum Alignment**

AP Biology:

Essential Knowledge 1.A.2 → Natural selection acts on phenotypic variations in population (Addresses artificial selection, antibiotic resistance & loss of species diversity. )

Essential Knowledge 3.A.1 →DNA, and in some cases RNA, is the primary source of heritable information.

(Addresses the genetic engineering of living organisms to isolate desired traits, genetically modified foods, transgenic and cloned animals.)

Biology:

Bio.2.2.1 → Infer how human activities (including population growth, pollution, global warming, burning of fossil fuels, habitat destruction and introduction of nonnative species) may impact the environment.

Bio.2.2.2 → Explain how the use, protection and conservation of natural resources by humans impact the environment from one generation to the next.

**Objectives**

* Students can design and engineer a product tailored towards a specific observation or opportunity seen at a tour/farm site.
* Students can elaborate on their experiences noting common misconceptions about agriculture and its impact on the economy and community.
* Students can incorporate real life observations from various tour sites to curriculum learned throughout the semester.
* Students strive to implement everyday practices to positively impact the agricultural efforts in their communities.

**Time & Location**

Students will be investing classroom time as well as time outside of the classroom for the full school year.

Students will be going on field trips to tour various sites in October, December, and February. Students will then submit a draft detailing their project idea along with any supplies they will need.

After the AP exam, students will spend 60 minutes every other day putting their project together.

In May, there will be an Ag evening event showcasing their projects.

**Teacher Materials**

In order to provide clarity in regards to student expectations, the teacher should provide rubrics and examples of work completed by previous students. If the teacher is coordinating field visits or tours to various farms or agriculture based facilities, the students need to have access to notes or ways to record what they observe. The [Observation Notes Handout](https://drive.google.com/open?id=1dnVoVoitdco0rlBBwPSwdKCaaDQrpdPowJhxJVyGkso) can provide a place for students to generate ideas and make notes about each location they visit. The [Student Engineering Project Rubric](https://docs.google.com/document/d/1HknExCZxsz88YafUNBsxqiRJTkQMFmMPSAUcE4PnGz0/edit?usp=sharing) provides a starting place for the general requirements to be communicated with the students. Each teacher can modify the rubric to his or her objectives. It is advised that teachers keep in mind the general process in which students will communicate their needs for their final product and presentation. The [Student Engineering Project Proposal Form](https://docs.google.com/forms/d/e/1FAIpQLSd8AdmCF_bqMmMDgjmh2Kgjv2a-2xtG6SUbRl-K7aTooqjsyg/viewform?usp=sf_link) allows students to communicate their ideas and basic needs to get the project started.

**Student Materials**

The materials that students will need will vary, depending on their choice of project and the resources available to construct the project. Most presentations will be done digitally or with visual props and aids. The technology required to instruct students to construct presentations will vary from PowerPoint presentations to printing documents for visual aids. Students are also required to provide an additional visual aid for their product. This can be done with varying resources as well (e.g. 3D printing, LEGOS, Spheros, robotics, landscape design, hardware, etc.) Common materials include (but are not limited to):

* Tri-fold board
* Project rubric
* Computers
* Presentation software
* Tour Site Handout

**Safety/Teacher Tips**

* Students will wear closed toed shoes during each tour visit.
* Make sure all permission forms are completed by a parent or guardian and returned by deadline.
* Secure bus and driver.
* Bring water and hats to stay cool in the event of warmer temperatures.
* Bring umbrellas and/or rain gear in the event of rain.
* Remind facilitators of trip that students must travel in safe areas to prevent or reduce the risk of injury.

**Student Prior Knowledge**

Students are presented with background knowledge of agriculture and the final product expectations.

Students are given background on specific markets and/or the function of each tour site and what to expect.

Because they basing their design and final product on their observations of different sites, their knowledge will come primarily from that visit.

AP Biology students should have a basic understanding of the following concepts:

* Farming and agricultural efforts in general help sustain our community locally and globally.
* The human population is consistently increasing. This should relay the concept that there must be sustainable practices in order to support the growing population with sacrificing the quality and safety of foods.
* Agricultural advancements are dependent upon the constant incorporation of cutting-edge technology, engineering and design.

Biology students should have a basic understanding of the following concepts:

* Understanding the role of producers in the cycling of carbon through the atmosphere.
* How humans impact their environments. (e.g. areas that need improvement as well as current conservation efforts)
* Genetically-modified organisms provide a sustainable way to provide food and clothing to populations of people.

**Teacher Preparations**

* Coordinating tour site visits.
* Ordering and providing the supplies to complete the project will be the largest portion of teacher preparation.
* Students will have to receive supplies in time to be able to work and complete final product.
* Coordinating Ag Event
* Coordinating student involvement
* Giving students periodic feedback
  + December→ deadline for draft or ideas for project
  + February → deadline for supply list and final draft
  + March → supplies arrive
  + May → after AP exam, students will begin constructing final product

**Activities**

During each tour visit, the students will be exposed to a vast amount of information. They are responsible for asking questions, recording information and taking pictures. The teacher and the tour facilitators will help answer those questions and provide students with ideas about how to apply this information to a final product idea. Students will compile information from each tour site and collaborate designing and engineering their final product. The aspects of real world application are numerous ranging from problem solving, hands on exposure and engineering and designing. This plan could be adapted by giving students specific ideas or locations to design a product for and specific tour site in comparison to the “blank canvas” model. When in classroom, students will submit ideas, draft, final product idea and supply list and then construct the final product. They will submit proposals and begin constructing their final presentations and products.

If the teacher does not plan to go on the field trips, the activities (product and presentation) still can include possible solutions and ideas for future use. The included rubric may need to be modified to fit a more “solution-based” grade. Students will be creating more hypothetical based solutions which are still great ways to challenge their understanding and skill.

Note: Another goal for this project is to create ways for students to visit the farms if their particular school or teacher cannot provide the field trip. Alternatives can include:

* Interviews with the farmers (video)
* Classroom visits with farmers
* Small school-wide Ag days with visitors
* Small school gardens
* Virtual tours

**Assessment**

The final product and presentation will be scored as their assessment. The teacher will use the rubric provided or a modified version to ensure all aspects of the project have been met. For AP Biology, this project could serve as a final exam grade for the semester. For Biology, this could count as a project or test grade. The teacher should look for specifics including relevance, creativity, clear application to real life, and completion. The students in advanced or honors courses should display higher order thinking skills when designing their product as well as the implementation in a real world aspect. The teacher can also incorporate a small role for those who are observing the final products for each student. The participants can also be given the task of identifying a product or overall presentation that stood out or was an overall stronger presence. The grade each student receives should be independent of the number of votes they receive. The teacher can decide what reward or possible incentive those particular students can receive.

**Critical Vocabulary**

The teacher should be sure that students are familiar with the general agricultural terms including but not limited to:

* Horticulture
* Hydroponics
* Irrigation
* Greenhouses
* Conservatory
* Vertical Gardens

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