|  |
| --- |
| **TEXAS CTE LESSON PLAN**[www.txcte.org](http://www.txcte.org) |
| **Lesson Identification and TEKS Addressed** |
| **Career Cluster** | Science, Technology, Engineering, and Mathematics |
| **Course Name** | Principles of Applied Engineering |
| **Lesson/Unit Title** | Principles of Applied Engineering: The Power of Ideas Lesson |
| **TEKS Student Expectations** | **130.402. (c) Knowledge and skills**(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:(B) Show the ability to cooperate, contribute, and collaborate as a member of a group in an effort to achieve a positive collective outcome; |
| **Basic Direct Teach Lesson**(Includes Special Education Modifications/Accommodations and one English Language Proficiency Standards (ELPS) Strategy) |
| **Instructional Objectives** | The student will be able to:* Define ideation
* Discuss the purpose and value of ideation
* Discuss the process of ideation
* Describe the role of an engineer in the ideation process
 |
| **Rationale** | After completing this lesson, the students will be able to discuss ideation and the role it has in corporate competitiveness and demonstrate their knowledge by passing a multiple-choice test. |
| **Duration of Lesson** | This lesson should take 1-2 days. |
| **Word Wall/Key Vocabulary***(ELPS c1a,c,f; c2b; c3a,b,d; c4c; c5b) PDAS II(5)* | None |
| **Materials/Specialized Equipment Needed** | * Test
* Bottle of soft soap
* Computer with internet access
* Projector and screen
 |
| **Anticipatory Set**(May include pre-assessment for prior knowledge) | * Students can take a pre-test on definitions and terms to identify areas of partial understanding and as a way to introduce this topic.
* **SAY:** Many of you have been taught that invention is a lonely, solitary process through examples of people like Ben Franklin and Thomas Edison. This is really not true. Most inventions and innovations are the result of a group of people working together.
* **ASK:** Do you know that many products we use today and take for granted were developed through a process developed by companies that are intended to produce new products?
* **SAY:** New product development is not an accident. It is a formal process companies go through.
* **SHOW:** A bottle of soft soap.
* **SAY:** Here is an example. The idea of a pump dispenser for soft soap was developed in the 90s through a group process of normal idea on. They took two ideas that were already common– soap and a pump dispenser – and combined them. Now you find this everywhere.
 |
| **Direct Instruction \*** | Outline | Instructor Notes |
| I. Definition of IdeationA. Have students complete the Ideation WorksheetB. Discuss how that appear similar can have specific definitions depending on the contextC. Students should also know the definitions and the differences between inventions, innovations, and improvementsD. Other topics you may want to reference about teamwork and collaborationE. What is Ideation?II. Purpose of Ideation A. Emphasize to students that companies view innovation as one of their key corporate strategiesB. Companies who fail to innovate cannot compete C. For many companies, innovation is the key to their survivalD. The purpose of Ideation is to generate a large number of ideas, good and bad, which raises the odds of having a truly innovative idea among the ones generatedIII. The value of Ideation A. Companies value ideation because it has been proven to lead to innovation and breakthroughs B. There is a defined process which can be used across many industriesC. It is a simple but powerful toolD. It adds value to the company but to the people involvedE. The process builds trust and demonstrates a shared corporate commitment to communication IV. The structure of the processA. The process itself is similar to brainstormingB. Analysis is involved by looking at industries and trendsC. Listening to the customer is one of the critical componentsD. Relationships need to be developed because trust and communication are vital E. Keys to Ideation F. Three Stages to Ideationa. Innovation b. Development c. Actualization V. Engineering challenges A. Engineers are considered to be great problem solvers but are not generally considered to be creative B. Ideation is a creative processC. Engineers can add value to the process, but need to be a member of a cross-functional to be more effectiveD. It is the team dynamics that are critical to the success of ideation VI. ConclusionA. The strength of an idea lies in its ability to be implementedB. Do not jump too quickly to the convergent process of evaluating and analyzing ideas until the divergent process of idea development through ideation is completely exploredC. Ideation requires the elimination (or at least reduction) of boundaries and limitations VII. Multiple choice quiz | * Teacher is encouraged to make a PPT presentation in conjunction with the outline.
* Distribute the Ideation worksheet for the students to complete. Students may use the internet, textbook, or dictionary to complete answers.
* Covers the definition of Ideation.
* Covers what is Ideation.
* Teacher talks through the differences between inventions, innovations, improvements.
* Teacher needs to discuss what it meant by breakthroughs.
* Students will take the multiple-choice quiz. Teacher may add additional questions from the Ideation Worksheet to take quiz if desired.
 |
| **Guided Practice \*** | The teacher will guide the students’ understanding of ideation and as students complete the Ideation Worksheet. |
| **Independent Practice/Laboratory Experience/Differentiated Activities \*** | Students will complete the Ideation Worksheet from the research, internet, a dictionary, and/or a textbook.  |
| **Lesson Closure** | * Question: What is the definition of ideation?
* Answer: The process of forming ideas
* Question: What is one of the key elements of problem solving?
* Answer: Creativity
 |
| **Summative/End of Lesson Assessment \***  | * Ideation worksheet and multiple-choice quiz
* Question and answer, discussion and feedback, in-class notes.
 |
| **References/Resources/****Teacher Preparation** | * Go over the attachments, and read through this lesson plan. Review the Ideation worksheet as a resource for terms and definitions. Pick several definitions from the worksheet for a pre -test to identify terms students may have a partial understanding of as a way to introduce this subject and illustrate how general terms like innovate and invent can have specific definitions depending on the context.
 |
| **Additional Required Components** |
| **English Language Proficiency Standards (ELPS) Strategies** |  |
| **College and Career Readiness Connection[[1]](#footnote-1)** |  |
| **Recommended Strategies** |
| **Reading Strategies** |  |
| **Quotes** |  |
| **Multimedia/Visual Strategy****Presentation Slides + One Additional Technology Connection** |  |
| **Graphic Organizers/Handout** | * Ideation Worksheet
* Ideation Worksheet answers
* Dictionary and/or textbook
* Multiple choice test
* Multiple choice test key
 |
| **Writing Strategies****Journal Entries + 1 Additional Writing Strategy** |  |
| **Communication****90 Second Speech Topics** |  |
| **Other Essential Lesson Components** |
| **Enrichment Activity**(e.g., homework assignment) | * This module emphasizes that companies want workers with more than just factual or procedural knowledge. They want workers who are creative problem solvers. This is a skill that can be developed with practice, but it is also difficult to come up with good problems for high school level students to practice with. One way to deal with this difficulty is to have speakers from industry describe some of the problems their company (or industry) has had, and the process they went through to solve the problem. The speaker could also introduce problems the company currently has so that students do not just look at problems that already have solutions.
* To hold an in-class ideation session requires the teacher (or perhaps a particularly well-suited student) to be a moderator and facilitator. It can also be difficult to come up with an ideation topic that is both interesting to students and one that students can come up with realistic ideas for, which is extremely challenging. However, the attempt to hold an ideation session is recommended as an enrichment activity. The assessment rubric can include the quality and quantity of the ideas generated and should reflect the seriousness with which the students approach the exercise.
 |
| **Family/Community Connection** |  |
| **CTSO connection(s)** | SkillsUSATechology Student Association |
| **Service Learning Projects** |  |
| **Lesson Notes** |  |

1. Visit the Texas College and Career Readiness Standards at <http://www.thecb.state.tx.us/collegereadiness/CRS.pdf>, Texas Higher Education Coordinating Board (THECB), 2009. [↑](#footnote-ref-1)