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| **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** | Engineering Design and Presentation, I |
| **Lesson/Unit Title** | STEM – Paper Airplane |
| **TEKS Student Expectations** | **130.410. (c) Knowledge and Skills**  (7) The student uses engineering design methodologies.  (A) The student is expected to demonstrate an understanding of and discuss principles of ideation  (B) The student is expected to demonstrate critical thinking, identify the system constraints, and make fact-based decisions  (D) The student is expected to apply decision-making strategies when developing solutions |
| **Basic Direct Teach Lesson**  (Includes Special Education Modifications/Accommodations and  one English Language Proficiency Standards (ELPS) Strategy) | |
| **Instructional Objectives** | Identify and explore career opportunities within the STEM Aerospace Pathway |
| **Rationale** | Students will learn about engineering and problem solving when tasked to design a paper airplane to carry as many paper clips as possible. |
| **Duration of Lesson** | 45-75 minutes |
| **Word Wall/Key Vocabulary**  *(ELPS c1a,c,f; c2b; c3a,b,d; c4c; c5b) PDAS II(5)* | * **Criteria -** what the design or product must do and will be graded/judged on * **Constraints -** what can be used and what cannot be used * **Variables -** one thing can be changed at a time in an experiment to see what happens; does itget better or worse? Then another variable can be changed to see that does. |
| **Materials/Specialized Equipment Needed** | * Student Handouts * Any type of foldable material, not larger than 8 1/2 “ x 11” * Notebook Paper * Scissors * Paper Clips * Landing area laid out by the teacher using tape |
| **Anticipatory Set**  (May include pre-assessment for prior knowledge) |  |
| **Direct Instruction \*** | **Investigation**  Current runways and air systems cannot handle the growing number of people and goods that need to travel by air. We can change the airports but a more affordable solution is to change the airplanes themselves.  Your job is to design a paper airplane model that can carry the maximum amount of cargo (paper clips) and land within the 10’ to 15” landing strip area. You will get a 5’ circle to land in. You will need to research different types of airplane designs and then test them. You will then select the best design and use it for your final design. The paper clips can be carried or attached anywhere you would like on the airplane, but you cannot use any tape or glue in making your model or attaching the paper clips.  Your model may be made of the material of your choice, but must not be larger than standard paper size (8 ½” x 11”). When flying your airplane, you must hand launch it from ground level. You may use your own design, or you can research other paper airplane designs and try them.  You will get to test and refine your model, but remember to only make one change at a time, so that you know for sure which change caused a result. Be sure to collect data on your results so that you can report your results and recommendations to NASA. Good luck and thank you for your help with this problem!  **Instructions**   1. Research different types of paper airplane designs and pick three to try; one can be your own unique idea if you wish 2. Test your ideas, changing one variable at a time, to see what the best idea is 3. Pick your best idea and use it for your final test, for the grade   **Paper Air Plane Construction and Setup**  Use any airplane design you like. |
| **Guided Practice \*** | Step #1 Handout – Combined with #2-#5 |
| **Independent Practice/Laboratory Experience/Differentiated Activities \*** | Step #2-#5 Handouts – Combined with #1 |
| **Lesson Closure** | * Review details of the STEM Aerospace Pathway using questioning techniques * Discuss upcoming career module experiences and expectations |
| **Summative/End of Lesson Assessment \*** | The students will investigate different ways that one of the Aerospace and how well they follow the engineering design process  *Individualized Education Plan (IEP) for all special education students must be followed. Examples of accommodations may include, but are not limited to:*  None |
| **References/Resources/**  **Teacher Preparation** | **Teacher Notes**   * Teacher should have researched possible airplane designs. Have those available for the students to look at and use. Otherwise they will need Internet access to research on their own. Have students work in groups of two to three on this. * Airplane must fly 10’-15’ and land within the 5’ landing area that the teacher has laid out with tape. * Provide the students with the paper clips, so that they all are equal. * Paper clips cannot be taped, glued etc. They must be removable so another class can use them. Clips can be placed wherever they work. * Foldable material used should not be bigger than 8 ½” x 11”. * Teacher selects the different types of material to be used, such as plain paper, notebook paper, card stock, construction paper, aluminum foil, and poster board. Have it already cut to maximum size and give the same amount of materials to each team. * Give students one day to test, then 10-15 minutes of the next day class to build final prototype. Then set aside 10-15 minutes to test them. Discuss at the end why some designs did better than others. * Advise that best team gets 100, then 98, 96, etc. |
| **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** |  |
| **Writing Strategies**  **Journal Entries + 1 Additional Writing Strategy** |  |
| **Communication**  **90 Second Speech Topics** |  |
| **Other Essential Lesson Components** | |
| **Enrichment Activity**  (e.g., homework assignment) | The students will investigate different ways that one of the Aerospace fields helps to improve our way of life. |
| **Family/Community Connection** |  |
| **CTSO connection(s)** | SkillsUSA, Technology Student Association (TSA) |
| **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)