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**CODE/MOE/UOIT Makerspaces Project**

**Lesson Plan: Grade 5 & 6 Science: Making a Space Shuttle Engine**

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| **Big Ideas:**1. Several technological innovations and products are built based on the properties of air
2. Flight occurs when the characteristics of structures take advantage of certain properties of air. (Overall expectations 1, 2, and 3)
3. Air has many properties that can be used for flight and for other purposes. (Overall expectations 1, 2, and 3)

**Overall Curriculum Expectations:*** Assess the societal and environmental impacts of flying devices that make use of properties

of air;* Investigate ways in which flying devices make use of properties of air;
* Explain ways in which properties of air can be applied to the principles of flight and flying devices.
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| **Learning Goals :*** Demonstrate an understanding of flying machines
* Make futuristic space shuttle engines keeping in mind the 4 forces of flight
 | **Success Criteria :*** Recognize and describe the properties of air and apply them to your design of an space shuttle engine of the future
* Distinguish between flying, gliding, and floating
* Name different characteristics that allow machines to move through the air
* Make a plan or a drawing of a prototype before making
* Make a flying engine according to the success criteria
* Describe ways in which the forces of flight can be modified to allow an engine to take-off and land successfully

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| **Lesson Overview:****Throughout this lesson, students will :*** Explore the forces that act on a structure during flight (drag and thrust)
* Make a prototype that is able to fly
* Follow the technological problem-solving skills continuum
* Use appropriate Science terminology (pertaining to flight)
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| **Materials and technology to be used:*** Toothpicks
* Aluminum foil
* Construction paper
* Plastic bottles
* Modelling clay
* Paint
* Cardboard
* Scissors
* Tape
* Straws
* Glue
* Laptops or tablets
* Apps and software
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| **Accommodations/Modifications:** * Form heterogeneous (mixed ability) groups keeping in mind students with different learning difficulties
* Allow students to present their results in their own manner
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| **MINDS ON: Getting Started** |
| The teacher will show a video to the class that introduces the 4 main ideas of flight :1. Properties of air;
2. The 4 forces involved with flight;
3. Space shuttles, airplanes, and astronauts/pilots
4. How aviation affects our daily life

Ask questions to check their preconceived notions about flight, space shuttles/airplanes, and pilots/astronauts. | Students will watch the video, participate in the discussion led by the teacher, and answer any questions posed by the teacher.  |
| **Describe how you will introduce the learning activity to your students. What key questions will you ask? How will you gather diagnostic or formative data about the students’ current levels of understanding? How will students be grouped? How will materials be distributed?** * Introduce the project to students
* A KWL chart will be used to collect diagnostic information (what do the students already know about flight?)
* Students will be grouped in teams of 4
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| **ACTION: Working on it** |
| The teacher will : * Review the success criteria
* Review the steps in the technological problem-solving process
* Discuss important safety considerations
* Introduce the project (making a machine that can be used for future space exploration)
* Invite students to make their prototype devices (which ultimately showcase what they have learned regarding flight) while they follow the “roadmap” (their plan)
 | Student will:* Follow safety considerations laid out by the teacher with respect to tools, materials, electricity, not throwing their flying machine at or towards anyone else, especially near their eyes etc.
* Follow the “roadmap” they’ve created, and conduct research regarding flight and space shuttle design
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| **CONSOLIDATION: Reflecting and Connecting** |
| During this phase, the teacher will : * Encourage students to explain a variety of learning strategies
* Ask students to defend the procedures/steps taken while making and to justify their answers
* Clarify any misconceptions
* Link strategies and solutions to similar types of problems to help students generalize concepts;
* Summarize the discussion and focus on key points or concepts.
 | During this phase, the students will :* Share their learning
* Justify and explain their thinking
* Reflect on their learning
* Use a variety of concrete representations to demonstrate their understanding
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| **How will you select the individual students or groups of students who are to share their work with the class (i.e., to demonstrate a variety of strategies, to show different types of representations, to illustrate a key concept)? What key questions will you ask during the debriefing?** * Students will receive a presentation checklist according to the format of presentation they selected (written earlier on their roadmap)
* Assessment of the final product may take the form of a rubric or checklist
* During the Maker Faire, students will present the challenge they sought to accomplish, explain the steps taken during the “making” phase, as well as important safety considerations they took into account, in addition to how their flying device works
* They will present the difficulties they encountered while making, along with the ways they succeeded in following their roadmap
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