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**CODE/MOE/UOIT Makerspaces Project**

**Lesson Plan: Grade 6 Science: Mars Lander Design Activity**

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| **BIG IDEAS:**  Technological and scientific advances that enable humans to study space affect our lives.  **Science and Technology Curriculum Expectations:**  **Overall Expectations**  Assess the impact of space exploration on society and the environment.  **Specific Expectations**  **2.3** use scientific inquiry/research skills (see page 15) to investigate scientific and technological advances that allow humans to adapt to life in space  **2.2** use technological problem-solving skills (see page 16) to design, build, and test devices ***(e.g., a sundial, a model of the earth’s rotation around the sun)*** for investigating the motions of different bodies in the solar system  **3.4** identify the technological tools and devices needed for space exploration ***(e.g., telescopes, spectroscopes, spacecraft, life-support systems)*** | |
| **Learning Goals:**  “We are learning to…”   * Follow the design process… Identify a problem, design, test , redesign and retest a shock absorbing system for a space lander. | **Success Criteria:**  “We will be successful when…”   * We have tested, redesigned and retested our system and we can describe how we improved our system. |
| **Lesson Overview:**  Students will be exposed to the dangers of landing on another planet. They will have to build, test, redesign, retest and record observations of a mock lander they produce. Students will develop skills in the design process and critical thinking. | |
| **Materials and Technology:**   * Smartboard or data projector * Website <https://www.jpl.nasa.gov/video/details.php?id=1074> video * Various picture/images of moon landers and mars landers * Various pictures/images of shock absorbing systems in our daily lives (car shocks, etc) * Building materials for each individual or group of students (small paper/plastic cup, 2 large marshmallows, index cards, pipe cleaners, straws, 20 cm X 20 cm piece of cardboard, mini marshmallows, straws, tape, glue, etc.) * Student handout “Touchdown Challenge – Student Response Sheet” | |
| **Student Accommodations/Modifications:**   * **Shared reading of student response sheet** * **Student handout on IPADs etc. for use with ‘Read and Write’ to help students with language difficulties.** | **Lesson will be differentiated by:**   * **Content, specifically:** * **Process, specifically:** * **Product, specifically: Students design own lander** * **Environment, specifically:** |
| **MINDS ON: Getting Started** | |
| Ask students to climb on to the seats of their chairs and jump to the floor.  Ask them what they do with their knees as the contact the floor?  Ask students why their knees bend?   * Answer – to help absorb the shock of landing on the floor   Ask student to think pair share other examples of shock absorbing systems they see in their day to day life; you may want to show pictures/images of these (car shock eg.) to encourage discussion. |  |
| **- Watch video at website** <https://www.jpl.nasa.gov/video/details.php?id=1074>  - Ask students what ways does NASA try to reduce shock in landers sent to the moon and Mars.  - Demonstrate dropping of small cup with 2 large marshmallows (astronauts) in it. What happens when I drop the cup from 30cm high? (The astronauts fall out and die)  - What could be done to this lander (the cup) so that the astronauts stay safely in lander? | |
| **ACTION: Working on it** | |
| * Students are asked to design (on paper) a rough drawing of what they plan to build given the materials provided on the “Touchdown Challenge – Student Response Sheet” * Students are asked to build their design and test drop their lander from a height of 30cm * Students are asked to complete the steps outlined on the response sheet | * Students design a better lander, test it, record observations, redesign and retest |
| * **Students may have questions about the response sheet – a shared reading of the questions prior to the task would be helpful** * **Students should not be allowed to cover or modify the actual cup the marshmallows are in.** * **Students with fine motor or behavioural concerns will need assistance from a teacher or peers** * **This task works well as an individual challenge or in small groups of 2 to 3.** * **Anecdotally assess students’ ability to cooperate and follow the design process.** | |
| **CONSOLIDATION: Reflecting and Connecting** | |
| Ask students to show off their designs and describe the systems they designed.  Ask a variety of students to test their landers for the whole class.  Ask students why redesigning their lander was important (it helped them to better solve the problem)  Is redesigning something you think might be important to astronauts at NASA? | Have a touchdown challenge showdown between a few of the better examples and drop from a greater height to see which is the best. |
| Select students who improved their landers by redesign or, who represent different examples of shock absorbing systems for final showdown.  Collect student handouts and use as a formative assessment. | |

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Touchdown Challenge – Design and Reflection**

**Question…**

1. Why is it important for craft landing on mars or the moon to have an effective shock absorbing system?

**Design…**

In the box below sketch a design of your shock absorbing system. **Include labels of the parts!**

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**Turn page over**

**Preliminary Tests…**

Test your landing craft 5 times and circle your results below. Both ‘astronauts’ must stay in the cup all 5 times to be successful. Remember these are people we are dealing with!

|  |  |
| --- | --- |
| Test 1 | Success? Yes No |
| Test 2 | Success? Yes No |
| Test 3 | Success? Yes No |
| Test 4 | Success? Yes No |
| Test 5 | Success? Yes No |

**Question…**

If you were unsuccessful what happened? How can you improve your design? Or, if you were successful what else might you do to further absorb the shock of landing?

**Secondary Tests…**

Test your landing craft 5 times and circle your results below. Both ‘astronauts’ must stay in the cup all 5 times to be successful. Remember these are people we are dealing with!

|  |  |
| --- | --- |
| Test 1 | Success? Yes No |
| Test 2 | Success? Yes No |
| Test 3 | Success? Yes No |
| Test 4 | Success? Yes No |
| Test 5 | Success? Yes No |

**Question….**

What were your final results? What improvements to your design made the test more successful?