Project cofunded by the European commission

LESSON PLAN "Me a scientist"
"How to select the best materials for our space craft?"

You are working on designing the "Full STEAM ahead " space craft…
You already know a lot about space and Mars life's conditions.
You want to built a space craft, you are wondering which materials could be the best one…

Let's start thinking:

"HOW TO SELECT MATERIALS TO BUILT A SPACE CRAFT?"

What are the main characteristics of the materials used in a spacecraft's shielding ?

Activity 1: Exploring the materials – Look and feel

Equipment:

- 1 set of cubes
- Magnets

 The cubes should not be damaged during the experiment.

Try to identify the materials of which the cubes are made of, only by their look and feel. Write down their properties in table. Present their answer for the material that composes each cube.

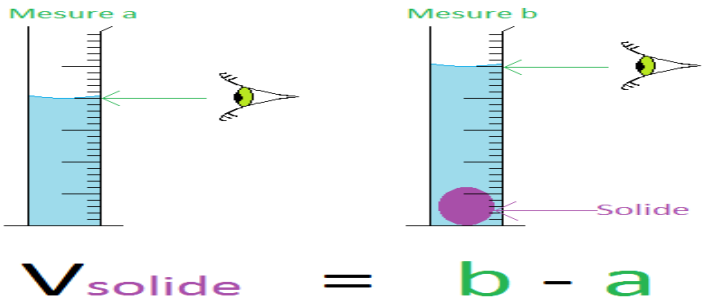
Cubes	Properties						Material
	Light ; heavy	Rough ; smooth	Hot ; cold	Shinny ; mettle	Magnetic (yes / no)	color	
1							
2							
3							
4							
5							
6							
7							
8							

Identify which properties of the materials are important to be tested.

Activity 2: Measuring the density of each material

Equipment:

- 1 set of cubes from the space craft
- 1 digital scales
- beaker with water
- ruler



✓ Compare the density measurement with the tabled values and you should find what the name of the material is.

Cubes	Mass (g)	Volume (mL = cm^3)	Density (g/cm^3)	Material
1				
2				
3				
4				
5				
6				
7				
8				

Material	water	copper	aluminum	brass	steel	wood	Stone (granite)	plastic	polystyrene
Density (g/cm^3)	1,0	8,8	2,7	8,5	7,82	0,13 – 0,8	2,6–2,8	0,9 – 0,17	0,015-0,03

Density values taken from http://www.engineeringtoolbox.com/

Activity 3: Electrical Properties

Equipment:

- 1 set of cubes
- 1 battery (4,5 V)
- Connecting wires
- Crocodile clips
- A lamp

Question: How can you test the electrical properties of the material?

✓ Schematize the electric circuit that you can realize with the given material.

✓ Construct the electrical circuit to examine the cubes electrical properties.

✓ Complete the following table :

Cubes	Does the lamp shine?	Is the material a **conductor** or an **insulator**?	**Material**
1			
2			
3			
4			
5			
6			
7			
8			

Activity 4: Thermal conductivity

In this activity, you will investigate which materials are good **heat conductors** using special heat sensitive paper (thermochromic paper) that changes color from blue to white when it is heated.

Equipment:

- 1 set of cubes
- 7 squares of thermochromic paper
- A box
- Hot water

✓ Place each cubes in the box.
✓ Place a square of thermochromic paper on top of each of the cubes to be tested.
✓ Pour the hot water up to **half** the cubes (no more !).
✓ You should register how quickly each thermochromic paper changes color.
✓ Complete the following table :

Cubes	Is this material **a thermal conductor?** (yes / no)	**Ranking (1 – 8)**	**Material**
1			
2			
3			
4			
5			
6			
7			
8			

Conclusion

After testing all the material, you can construct a table with the main characteristics.

cubes	Material	Look and feel	Electrical conductivity (yes/no)	Thermal conductivity (ranking)	Density (g/cm3)	Magnetic (yes/no)
1						
2						
3						
4						
5						
6						
7						
8						

Which one would you select? .....

Discuss about it with the team!

Correction

After testing all the material, you can construct a table with the main characteristics.

cubes	Material	Look and feel	Electrical conductivity (yes/no)	Thermal conductivity (ranking)	Density (g/cm3)	Magnetic (yes/no)
1	Copper (cuivre)	Shiny, cold, heavy	yes	3	8,8	No
2	Aluminium	Shiny, cold, quite light	Yes	1	2,7	No
3	Brass (laiton)	Shiny, cold, heavy (lourd)	Yes	2	8,5	no
4	Steel (acier)	Shiny, cold, heavy	yes	4	7,82	
5	wood	Dull (terne), warm (chaud), light	No	8	0,13-0,8	No
6	Stone(granite)	Dull , cold, quite heavy	No	5	2,6-2,8	No
7	plastic	Dull , cold, light	No	6	0,9-2,17	No
8	polytstyrene	Dull , warm, light	No	7	0,015-0,03	No