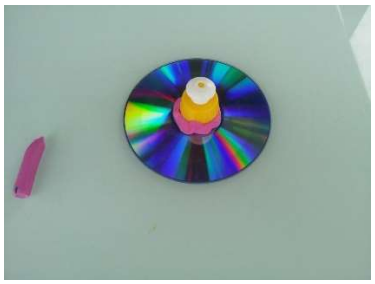
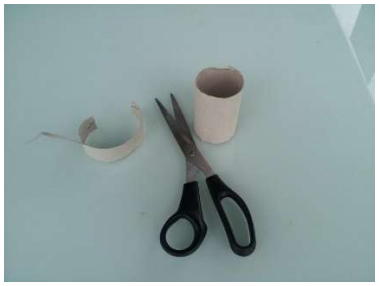
1. Name of the lesson	***OUR OWN HOVERCRAFT***
2. Target group	9-10 years old
3. Duration	45 minutes
4. STEAM Skills/ 21st Century Skills??	Critical Thinking Communication Collaboration Creative Thinking Problem Solving
5. Expected learning outcomes	By the end of this unit, learners will be able to: ● Explain what is friction and its effects ● Explain what is hovercraft and how it works ● Build his own model of hovercraft ● Notice the connection between technical and artistic-designing knowledge
6. Subjects and topics covered	Physics, arts In particular, through the activity, students: - understand the definition of "friction" and what's its influence on all of the aspects of life - can use their manual skills and available materials to create a small invention, mechanism which work as the machines which he can see in anywhere in the world. - By using creative thinking, student can figure out by himself what is necessary to build a hovercraft, which objects have specific, needed features to implement in the specific mechanism and how to connect all of them to receive desired effect. - find methods to solve the problem created by natural laws of physics which is friction and overheating of materials and how to deal with it. - during discussions made in the classroom before the activity, student can revise his knowledge about friction, different types of vehicles, components of the vehicle which are fundamental and necessary for it to work properly. Thanks to that he can find connections with other mechanisms and figure out which elements can help it to move on to particular surfaces. - understand the way of how specific mechanisms work and how to create them to fulfill their function. In addition, thanks to this activity students may be able to get more interests in technical work and see that building and constructing is not very difficult and even they can do that by using simple materials.
7. Methodologies	Design Thinking Inquiry based learning Problem based learning

8. Integration of the Arts	Arts are integrated during the entire exercise, since students are engaged in the creation of manual objects, using creativity and imagination, as well as in the discovery of new materials and their properties.
9. Learning Environment	Classroom
10. Required resources	• 5-6 blankets • 5-6 rubber linings • Scissors • Plasticine • toilet paper rolls • bottle caps with moving up-down closure – e. g. from dishwashing fluid • balloons • CD's
11. Prior knowledge **a. teacher** **b. students**	In order to deliver this lesson, the teacher will need to have the following knowledge and skills set: • what is friction and what effects it causes • which surfaces produce more friction when they interact • how the hovercraft works and for what it can be used In order to be able to participate and contribute to this lesson, the students will have achieved the following standards: • awareness of friction existence • knowledge about how do the specific vehicles move and on which surfaces they can do that
12. Detailed description of the step-by-step sequences of the unit, incl. specific activities to support the learning experience	STEP 1: What is friction? Exercise n.1: • Ask students to rub their hands together. Ask them what they experienced. What was the feeling? The answer is: warmth caused by friction. Friction occurs in everyday life situations: while walking we rub our feet on the floor, thanks to friction we do not stumble or fall, thanks to friction various vehicles move. The side effect of friction is warmth. • Ask students: So, what can happen to every vehicle during moving because of friction? What can happen to the vehicle components it is built of? The answer is: They can overheat during moving. • Ask students: What does prevent them from that? The answer is: Special materials they are built of. STEP 2: Friction of materials • Divide all students into few smaller groups (around 4-5 persons in each). • Give each group one blanket and one piece of a rubber lining • Ask one child in each group to seat on the blanket

	• Two other children should try now to move the child sitting on the blanket by pulling two corners of the blanket. • After that ask the same child to seat on the rubber lining and again let those two children to move him by pulling two corners of the lining. • Ask a question: ➢ Which surface was easier to move on the floor? ➢ Why was it like that? The answer is: Blanket, because it produces less friction than the rubber (example: rubber soles of shoes have been designed to not to slip on a slippery surfaces). STEP 3: Discussion Start a discussion with students: "Let's imagine that blanket and the rubber linen were examples of two vehicles. Both of them had to move on the same surfaces which were: ground, sand, water, ice, snow. One of them can't do that because it will produce too much friction and will overheat or will sink under the water, but the other one can move on each of those surfaces. How do you think – what kind of the vehicle can do that? The answer is: the hovercraft STEP 4: Hovercraft features • Explain children how hovercraft is constructed. You can play a video: https://www.youtube.com/watch?v=2y7Pdxcyql0 – ENG longer version https://www.youtube.com/watch?v=moahMIqaek0 – ENG shorter version (1) https://www.youtube.com/watch?v=W2r6Sqibdfo – ENG shorter version (2) • Ask a question: What are the features of the hovercraft which allows it to move on so many different surfaces without creating too much friction? Answers: - It moves on a skirt (type of chassis) which contains air inside - It has propellers which create the driving force and power the fans - It has fans which blow the air underneath the hovercraft STEP 5: Building your own hovercraft (you can find pictures in Annexes) 1) prepare a CD, a screw cap and plasticine 2) using plasticine, fix the cap on the CD 3) cut a hovercraft collar from the cardboard cylinder (cut about 2 cm of cardboard from the top) 4) inflate the balloon and twist it so it does not deflate 5) insert the twisted end of the balloon into a cardboard collar 6) put the tip of the balloon on the movable part of the cap YOUR HOVERCRAFT IS READY! Now to let it work, open the movable part of the cap. The escaping air is put under the CD so it created an airbag. Thanks to that the hovercraft can move easily on the table or floor surface without creating a friction.

	Under the template you can find some pictures presenting following steps of creating the hovercraft.
13. Gender-inclusive strategies and activities planned	Both boys and girls participate in they activity: they discuss about the topics presented by the teacher, take part in the activity with blankets and rubber linings and finally, they build their own hovercraft.
14. Assessment & Evaluation	Assessment and Evaluation of students (by the teachers) will be based on the monitoring of the acquired skills: - Intuition - Creativity and Imagination: students develop creativity and problem-solving skills and train spatial imagination - Problem Solving: the students describe the advantages and disadvantages of a hovercraft, while analysing the causes and the effects - Inquiry: the students conduct experiments related to friction
15. Annexes	For further information: https://www.youtube.com/watch?v=2y7Pdxcyql0 – ENG longer version https://www.youtube.com/watch?v=moahMIqaek0 – ENG shorter version (1) https://www.youtube.com/watch?v=W2r6Sqibdfo – ENG shorter version (2) Activity pictures STEP 1.  STEP 2.  STEP 3. 

	STEP 4.  STEP 5.  STEP 6.