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Title of the STEPAM Unit: Materials Box Challenge

AUTHORS (NAMES /SCHOOL / COUNTRY): EXPERIENCE WORKSHOP, JAGODINA

RELATED SUBJECTS	AGE GROUP OF THE STUDENTS	TOTAL ACTIVITY TIME	LEARNING OBJECTIVES DURING THE LESSON SUBJECT-SPECIFIC COMPETENCIES	LEARNING OBJECTIVES AFTER THE LESSON
Mathematics, Science, Physical Education, Language, Arts	1-4 grade (6 to 11 years old)	90 minutes	Developing pattern recognition through observations and physical modeling. Experiencing problem-solving in 2D and 3D geometry. Developing fine motoric skills. Finding connections between different areas, e.g. real-life and mathematics, science	Students can recognize geometrical characteristics of everyday objects. Students can recognize geometrical characteristics of scientific structures. Students understand the configuration of carbon molecules in Fullerenes and Nanotubes.

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OVERVIEW: TOPIC & PURPOSE



In this unit the students can physically construct the different basic geometrical shapes using the materials with different caractheristics. The main charactherists of Materials (natural materials, rough, smooth, hard, soft, stretchable, non-stretchable), and the main geometrical structures are cube, cup, pyramid, prism, cylinder, cuboid and ball. Combining egineering with art studens will create predetermaned shapes using given materials. students will learn through examples in everyday life how the properties of materials affect their use for making different objects. The focus will be on sports props (different types of balls) that will be used to start the discussion. The created models will be used to set up the Box challange game, the aim of which is to connect physical and cognitive activities. The students will have the task of reaching the box using different types of movement and drawing out a shape that they will have to return to the starting position where they will have the task of writing the characteristics of the extracted material.

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ACTIVITY PREREQUISITES -

STEAM ELEMENTS

ELEMENT 1: context presentation	What are the geometrical characteristics of the design of an everyday object, e.g., a soccer ball, skyscraper building etc? Does it have connections with other subjects? Is it scientifically relevant? How we can approach it from the perspective of different caracteristics of materials?
ELEMENT 2: creative design	Making geometrical models (cube, cup, pyramid, prism, cylinder, cuboid and ball). Using different materials in order to bust the creativity in children. Using differnet way of movement – Running, skiping, hopping, crowling etc. to reach to Box (Challenge) Modifying the models based on grades or aesthetic principles or just for fun.
ELEMENT 3: emotional and social learning	Learning cooperation and communication skills through working in groups. Experiencing focus and concentration during the building process. Learning about Fair- Play and Wining and Losing, and how to respect opponents.

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STEAM SUBJECT ELEMENTS

STEAM SUBJECTS	SCIENCE	TECHNOLOGY	ENGINEERING	Physical Education	ARTS	MATHEMATICS
SHORT INTRODUCTION TO RELATED SUBJECT ELEMENTS	Geometrical modeling of molecular structures. Materials (natural materials, rough, smooth, hard, soft, stretchable, non-stretchable)	Using electronical devices (Computers, Tablets or Mobile phones) to create a mind map about the caracteristics of materials.	Learning about the design of basic structures	Differnet way of movement – Running, skiping, hopping, crowling etc. Games	Hands-on modeling, modifications of the design, creating structures based on cube, cup, pyramid, prism, cylinder, cuboid and ball with different materials.	Exploring the basic geometry Cube and cuboid, surfaces (flat and curved).

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SYLLABUS

LESSONS	SUBJECTS	TOPIC OF THE UNIT	LEARNING OBJECTIVES DURING THE LESSON: SUBJECT SPECIFIC COMPETENCIES	LEARNING OBJECTIVES AFTER THE LESSON: STEAM COMPETENCIES
1	**Mathematics Engineering, Science & Arts.**	**Creating of different geometric structures.** **Making hands-on models.** **Modifying models based on scientific principles, transformations.** **Modifying models based on aesthetic motives.**	The students observe, understand and recognize various geometric shapes. Students are learning how to build various geometric structures (cube, cup, pyramid, prism, cylinder, cuboid and ball) Students are using their creativity to create previously mentioned shapes (Textures, different designs, colors)	The students recognize geometrical patterns in everyday objects. Student learn how to bild different structure using different materials. The students learn the properties of the materials that determine their use. The student use to creativly combine different material and design (<>>>>)

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2	**Physical education,** Mathematics, Science and Language (Foreign)	Different kind of movement (Running, hopping, skiping, crowling etc). Development of motor skill (Speed, agility and coordination). Team work, team building and competition among teams. Recognition of different geometric shapes. Recognition of natural and artificial materials Writing skills	The students are physicaly active and they develop their physical skills. They also, learn to work in the team and are involve in team competition. Learning about winning and loseing. The students confirm knowledge about various geometric shapes. The students confirm knowledge about natural and artificial materials Students observe, understand, recognize, test knowledge how to write the various related words.	Students are more active and healthy. Improving their motor skills. The students recognize geometrical patterns in everyday objects. The students use geometrical and symmetry principles to explore and describe the patterns. The students apply their geometrical knowledge in everyday life
2	**Art, Physical Education**	**Making hands-on models.** **Modifying models based on scientific principles, transformations.**	The students actively explore geometrical structures by constructing the models. The students experiment with modifications of the	Exploring Science and Art connections in Geometry and in Symmetry.

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		Modifying models based on aesthetic motives. **Inventing games and playing free with the models.**	models based on different motives. Game design and free play.	

INSTRUCTIONAL PLAN BY LESSON (COPY AS MANY TIMES AS NEEDED)

LESSON Grade 3-4 Science, Engineering, Physical Education, Art (Language) and Mathematics

TIME PLAN	TEACHING & LEARNING ACTIVITIES	MATERIALS	LEARNING OBJECTIVES
INTRODUCTION **(5-10 minutes)**	Introducing students to the different characteristics of the ball during the game and naming the material. Balls are made of different materials. Collecting various sport ball in the school / on the internet. Describing and discussing them.	Real sport balls – various designs (Basketball, football, Handball, Table tennis, Hokey etc.). Introducing balls that are made of different materials. including glass, wood, metal, plastic, rubber, leather, etc. Internet and further sources Attached PDF slides: Slide nr. 1-6	Students explore the properties of materials using different kind of balls. Students explore 2D and 3D geometry.
LEARNING ACTIVITIES **(60-70 minutes)**	Introduction to the modeling toolkit through free build and comparison of outcomes. Building the model of different geometic shape in	Selfmade modeling toolkit with including plasticine, clay, plastic, wooden materials and paper, metal, rubber and balloons,	Through physical modeling and playing students explore the modular structures in real-life, in science and mathematics and art.

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	groups. Each group has a task to built predetermant object with predetermant characteristics. Setting the Box Play challenge with the constructions created by groups here. Observe and evaluate the various characteristics of objects and materials within Box challenge activity, e.g.through group competition.	sponges, and cooton and wool materials. Attached PDF slides: Slide nr.7 -14.	Through physical activity and competition students are developing motor skills and learn about fair play.
WRAP-UP & EVALUATION (15-20 minutes)	Publication of the results of Box challenge. Learning about the misstakes by examples in othere areas. Comparing physical models, sharing stories of the building process. Outlook to the appearance of similar structures in real life. Creating a concept map individually and/or collaboratively.	~~Using previously made models with toolkit and sport equipment (balls, sponges etc.)~~ Attached PDF slides: Slide nr. 14-20. Tablets and computer to create a concept map (Or personal mobile phones).	Learning to accept mistakes and wining or lossing in competition. Summarizing, structuring, contextualizing the new information

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EVALUATION PLAN BY LESSON

LESSON	EVALUATION CRITERIA	EVALUATION METHOD
1, 2	Does the student understand / know how a understand how the properties of a material determine its use in real life.	Making concept map
	Did the student construct correctly all given objects using all material?	Observation, comparing products
	Did the student presented creativity in creating/ crafting objects (used given/suggested art technics)	Observation and evaluation of creativity (technics) art craft.
	Is the student able to present their experiences?	Observation, peer-review of presentation materials
	Is the student able to implement what they learnt?	Creating a project for recontextualizing and adapting the idea (Homework)
	Did the students cooperate with each other in the groups and accepted the results of Box challenge (Fair Play?	Observation, self-evaluation of groups / students.

NOTES -

ACTIVITY SHEETS TO BE LINKED -

EVALUATION MATERIALS TO BE LINKED -

REFERENCES / SUPPORTING MATERIALS TO BE LINKED

PDF / PPT slides:

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