BRIDGE TO MULTICULTURAL LEARNING AND CREATING

Multigenerational learning program

Didactics for physics/chemistry/technical phenomena recognition

TABLE OF CONTENTS

1. INTRODUCTION

This program presents multigenerational activities for seniors and preschool children. The program was created in Erasmus+ project Bridge to multicultural learning and creating. One of the common themes of the multigenerational activities described in the program are didactics for physics/chemistry/technical phenomena recognition. The aim of this multigenerational learning programme is to develop children's and maintain seniors', manual and mental skills.

The main target group of the program are senior mentors. The program seeks to give elderly the opportunity to actively age by mentoring in multigenerational activities. With mentoring in program, elderly can transmit their knowledge and skills to the youngest generations - pre-schoolers. This program also provides the seniors opportunity to learn about didactics and use their manual skills during the making of didactics. Traditional didactics used in senior´s childhood are adapted to modern child via transition of senior´s knowledge, skills and values to preschool children.

The program should be implemented in collaboration between senior mentors, preschool teachers, and adult education staff. Thus, this program also develops and strengthens the knowledge, skills, and competencies of adult education providers, preschool teachers, and senior mentors – it can be achieved by transnational professional and peer learning, sharing ideas, practices, and methods.

This multigenerational learning program consists of five multigenerational learning activities developed by project partners from different countries:

1) The Little Wizard – developed by partner from Slovenia *(Ljudska univerza Jesenice)*
2) Create a Colourful Volcano – developed by partner from Cyprus *(LCEducational LTD)*
3) Small Sustainable Farm – developed by partners from Croatia *(Pučko otvoreno učilište Koprivnica and Dječji vrtič Tratinčica)*
4) A Balance Scale – developed by partners from Slovenia *(Zasavska ljudska univerza and Vrtec Trbovlje)*
5) Catapults – developed by partner from Estonia *(Mittetulundusuhing Vitatiim)*

2. AIM OF MULTIGENERATIONAL LEARNING PROGRAMME – DIDACTICS FOR PHYSICS/CHEMISTRY/TECHNICAL PHENOMENA RECOGNITION

The aim of this multigenerational learning program is to develop children´s and seniors' manual, mental and social skills and improve multigenerational communication. Through the different learning multigenerational activities children develop awareness about repurposing found objects, and learn how to use waste materials in practical ways. These activities give the elderly the opportunity to share their knowledge and experiences with younger generations. Thus, children improve their team building skills, practice problem-solving, and strengthen their creativity and critical thinking, while at the same time they preserve their cultural heritage and develop their interest for the environment and its preservation.

2.2. Expected impact to senior mentors

This program is suitable for seniors who have knowledge and experience in collaborating with children, or who are happy to work with children.

Specifically, in this program the elderly:

- Are motivated to participate in multigenerational activities.
- Are able to present their own heritage and culture while also learning about other cultural heritages.
- Are given the opportunity to learn about didactics and children´s development, skills, and abilities.
- They will learn about children's abilities through work with a preschool teacher, and how to present activities to children.
- Discuss traditional values of the past.
- Gain interest in constructing things from different materials and generally in handicrafts.
- Develop their communication skills and become aware of the importance of helping children develop a positive attitude towards making things themselves.
- Designing and creating devices with project partners, and working with children in kindergarten will help the elderly develop the skills necessary for teamwork, communication skills and skills needed to work with different generations.

2.3. Expected impact to preschool children

During the implementation of this program in practical work, children:

- Acquire important intergenerational communication skills that promote positive relationships with the elderly.
- Learn to work in teams, cooperate, and mutual respect.
- Develop cognitive and problem-solving skills, logical and critical reasoning.
- Strengthen their mathematical skills.
- Gain manual skills and precision.
- Develop visual discrimination and keen observation; enhance eye-hand coordination.
- Develop creativity and imagination.
- Develop a positive attitude towards the reuse of various materials and the things which they produce.
- Learn the meaning of empathy, traditional values, and culture history.
- Through the process of making a scale, children will acquire manual skills, accuracy, develop a positive attitude towards the reuse of different materials and learn about the original, basic unit of mass - 1 kg as well as learn how to name it.
- Working and cooperating with the senior mentors will bring additional value to children and will help them gain wisdom and clarity due to the life experience and knowledge that the seniors possess.
- Through the process of working on a catapult, children will learn basics of physics: for example something about Newton's Three Laws of Motion.
- Learn about sustainability, water and electricity.
- Their interest in technology and engineering will increase.
- They will learn about water energy, electricity, water pressure and mechanical energy and how to use natural energy in a sustainable way.
- Visualize record observations using words, pictures, charts, and graphs use a variety of simple tools to extend observations.
- Sorting and classifying (including shape, size, number), compare, sort, classify, and order.
- Learn about geology.

- Motivate children to learn about the phenomena in their surroundings, teach them to observe phenomena, and try to investigate the specifics of them and find their laws.

3. SCOPE OF ACTIVITIES

Each multigenerational activity described in this program can be implemented in 10 hours which can be divided in 5 workshops. We suggest 5 workshops of 2 hours.

3.1. Multigenerational activity: The Little Wizard

3.1.1. Aim and purpose of multigenerational activity

The aim of the program is to transfer the knowledge that the elderly have in the field of physics and chemistry to the youngest generations, namely in such a way that the children carry out experiments and make didactics. The second aim of the program is to strengthen the connection between these two generations and enable the transfer of knowledge, skills and values from the youngest generation to the older ones. The purpose of the program is to give the elderly the opportunity to transfer the games from their childhood to preschool children (4-6 years old). In childhood, the elderly invented most of the games themselves. By transferring it, they will increase children's awareness of the importance of independent observation, creation and learning of the environment, as well as the connection between certain phenomena and reactions, which will strengthen children's critical thinking and independence.

Throughout the program, we pay special attention to the preservation of cultural heritage, as the children will learn about folk music and fairy tales while making didactics.

3.1.2. Description of the manufacturing

- **<u>INTRODUCTORY WORKSHOP – LIGHT AND COLORS</u>**

At the introductory workshop with the children, we immediately make a magic wand, transfer magic powder (magic powder is invisible) from a special bottle to spice bottles and learn three basic magic words (hokus-pokus, chira-chara chiribi, arhus-barktum). Before each attempt, we use a magic wand or magic powder and a magic word.

The content of the first workshop is supposed to be light. Children already have experience with it, it is around us all the time, there are many interesting experiments that they can repeat at home or later in a group at kindergarten. At this meeting, we pay special attention to learning about the properties of light, the formation of the rainbow, why we see objects in colors and the practical making of colored glasses.

With an interesting introduction, it is necessary to arouse children's curiosity and inspire them so that everyone will carry out experiments under the guidance of a mentor without fear. The introduction should be a group one, should be conducted by the workshop leader and should last no more than five minutes. We would start with questions about seeing and light that the children answer. We would ask 3 to 5 questions. A short story about light and darkness would follow. We weave into the story the question of which organ we are looking at. To really look with the eye, we make sure that the children squint and therefore see only darkness (because light does not enter the eye). They can also put their hands over their closed eyelids.

It makes sense for children to perform and learn about phenomena and experiments in smaller groups, three to four children in a group. In this way, every child can really do experiments and be active all the time (observing what others are doing or doing it themselves). In larger groups, insecure children do not take their turn or are afraid, so they withdraw into their own world and are not interested in what is happening. The children should do each set of experiments for 20 minutes, so we have to prepare four sets. If there is more than 16 children, prepare each set in duplicate. The groups circulate throughout the workshop, so that the children get to know all the prepared phenomena and experiments.

<u>1ST SET</u>

Magic (illusions) with light

- Place two index fingers horizontally in front of your eyes and look into the distance. → There is a piece of finger between the two index fingers, which can be seen even better if you move the index fingers slightly apart.

Implementation: Sprinkle with the magic powder (virtual powder in the spice jar) of the index finger. About 20 cm to 30 cm in front of the eyes, we place the tips of our right and left index fingers in a horizontal position. We look into the distance through the pointers. Two more new pointer tips appear, cut off and touching. If the index fingers are separated by about 2 mm, a gap is created between the new tips and a part of the index finger seems to lie between the original index fingers like a balloon.

Explanation: Since we do not focus the image of the pointers (looking into the distance), our brain does not combine the image from the left and right eyes, so the brain sees the pointers doubled, four in total. Let's make sure of that. If we place the pointers vertically instead of horizontally and look past them into the distance.

- We put a coin under the glass and pour water over it. → The coin disappears at a certain level of water.

Implementation: Tap the glass with a magic wand and say the magic word arctus-barktum, water hide the coin. Place a coin (or another flat object or a picture) in the middle under the bottom of the empty glass. We look from the side and see the coin clearly. We start pouring water slowly. The coin drowns in water and at some point, disappears.

Explanation: The light rays from the coin are refracted on the surface of the water. At a certain moment, the angle of refraction is critical and there is complete reflection at the water surface. The coin seemingly disappears because the rays no longer reach our eye due to reflection.

- We put a straight stick in a jar glass, which is half full of water. → If we look at it from the side, it is thickened on the side that is farther from our eyes. Looking at the stick from above along it, it appears to be broken at the water level.


Implementation: Tap the glass with a magic wand and pour the magic powder into the water. Dip the stick in water. Seen through the wall of the glass, the rod thickens if it is moved towards the opposite wall of the glass. If we look at the stick from above in the direction of the stick, it appears that the it is broken at the level of the surface.

Explanation: Rays are refracted when passing from water (glass) to air. Since the glass is round, the water in it acts as a magnifying lens, so objects in the water are magnified. In longitudinal viewing, the rays from the rod submerged in the water enter the eye at a different angle than the rays from the part of the stick looking out of the water. The result is that we see the stick broken.

Conclusion: light can also deceive us in our seeing.

2ND SET

Colors in light (rainbow)

- We look through the feather of a bird (pigeon, goose, chicken etc.) towards the lamp. → We see more rainbows.


Implementation: Sprinkle the bird's feather with magic powder and say the words: chira-chara chiribi feather turns the lamp into a rainbow. Let's use the white light of a lamp (maybe a cell phone lamp). We look at it through a bird's feather and we see the lamp in rainbow colors in several places (usually in the shape of a cross).

Explanation: A quill consists of tiny hairs that are stuck together but have thin gaps between them. The light bends at the slits at different angles, depending on the color. The differently colored images of the lamps are composed into a spectrum of all the colors that make up white light.

- Spray water in the air in the opposite direction of the light source. → A rainbow appears in the scattered drops.


Implementation: We take a bottle for spraying water (from ironing, from detergent for washing dishes or for washing, ...) and pour water into it. Tap the bottle with a magic wand and say the words: arhus-barktum. Spray in the opposite direction of the line that passes through the light source and our eyes (the light source is behind the back). Rainbow colors appear in the scattered drops.

Explanation: white light is refracted and reflected in scattered drops, but differently for different colors, which is why the light in the fog appears to us in iridescent colors. We observe this phenomenon in nature, when the sun shines and it rains, a rainbow appears. Rainbows are also seen when the moon shines through high clouds at night.

- We blow up a big soap bubble. → We see rainbow colors on it.

Implementation: Sprinkle the soap dish with magic powder. Blow a soap bubble from the soap dish with the help of a ring or a straw. On it, they observe how different colors flow. As the wall becomes thinner, the colors on the bubble change.

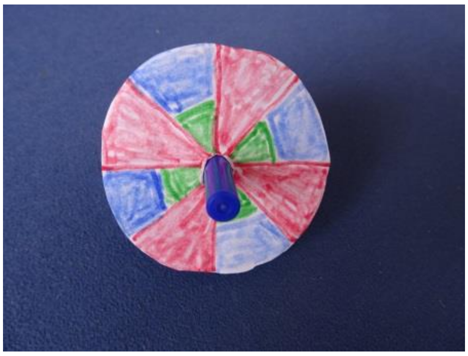
Explanation: Rainbow colors on a soap bubble are created because the rays reflected on the front and on the inner wall of the bubble interfere with each other (amplify or weaken). Due to the different thickness of the walls, different colors are reinforced. Over time, the walls become thinner (evaporation) until the bubble bursts.

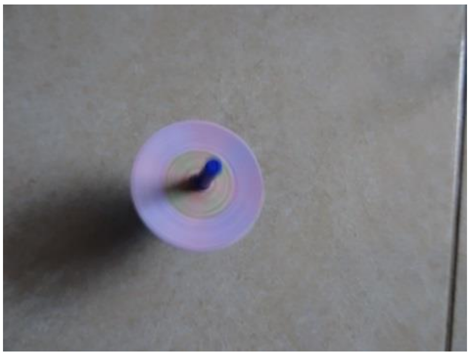
- The light is refracted with a glass prism. → The resulting rainbow contains all the colors emitted by the lamp.

Implementation: We hold the prism in our hand and whisper the magic words to it: hocus pocus, reveal the secret of light. We pass a beam of white light through the prism, which splits into a rainbow. We observe the rainbow on the wall or on a sheet of paper.

Explanation: A prism is glass ground in a special way. Due to the different length of the path in the prism, the refraction of light causes the light to split into its component colours and a rainbow emerges from the prism.

➢ Combine different colors with a colored spinner. → We get different colors, white can be used as well.





Implementation: Since we know the secret of light, which the prism revealed to us, we will make colors ourselves. On a spinning top (bought or made), we change paper templates of two or three colors. These paper templates are made by the children themselves following the instructions of the mentor. When rotating, composite colors appear. With a certain combination of colors, we can also get a white color.

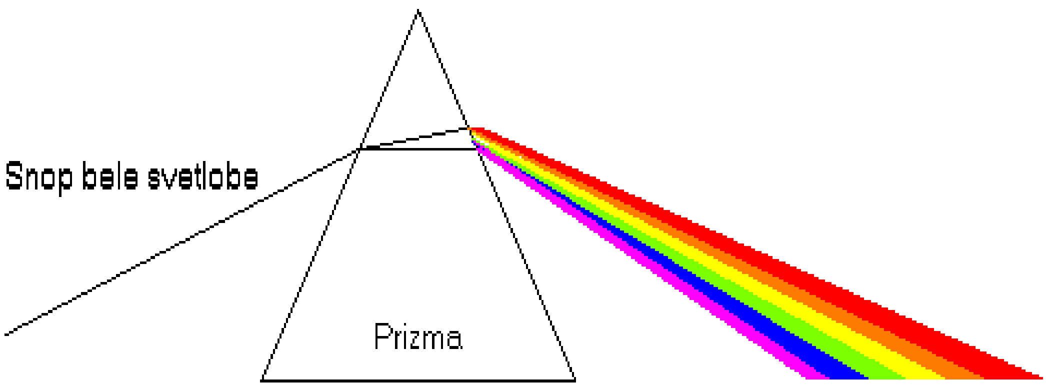
Explanation: the colors coming from the spinning carousel into our eyes seem to mix in the brain into another composite color. The result of the experiment is similar to mixing different colors of tempera crayons.

Conclusion: white light is made up of many different colors.

3RD SET

A lens as a magnifying glass and a camera

➢ We look through the water in a transparent bottle. → Up close we see enlarged letters, looking into the distance turns the picture upside down.




Implementation: Fill a transparent bottle with flat walls halfway with water. Before the experiment, tap the bottle three times with a magic wand and say the magic words. Place the bottle in a horizontal position on the newspaper and look at the letters under the bottle from the top. Slowly move the bottle away from the letters. The letters become larger as it happens with a magnifying glass. Then we raise the bottle in a horizontal position and look at the surroundings through it. The image of the surroundings is turned upside down, similar to a camera.

Explanation: The water in the bottle has the shape of a converging lens, so up close it acts like a magnifying glass. When looking at the surroundings through the water, the water in the bottle behaves like a converging lens in a camera that inverts the image.

- With the right magnifying glass, we look at our hands and distant objects. → We get an enlarged image; if we look at distant objects, the image is inverted.


Implementation: Whisper the magic words arhus-barktum into the magnifying glass and give it to the children to use. With a magnifying glass (it can also be a lens from glasses), children look at objects (hands) up close and say what they see. In the next step, they look at the surroundings through a magnifying glass and report their findings. We use the lens to capture an image on paper (a real image). The children say that the picture is upside down and the sides are also switched.

Explanation: A converging lens collects rays, so it magnifies like a magnifying glass when looking at close-up objects, and like a camera when looking at distant objects.

➢ With the lens we collect the rays in the focal point. → In the focal point we see the Sun.

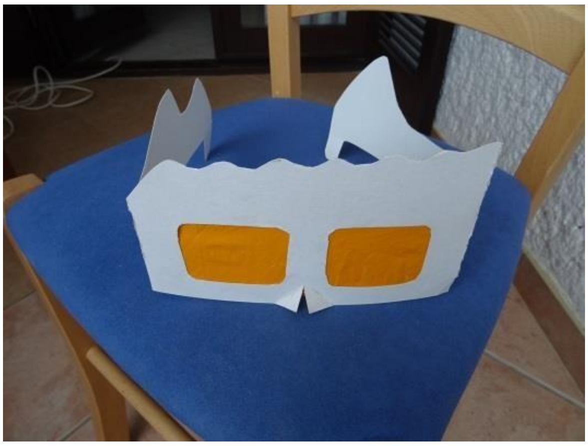
Implementation: Hit the lens twice with a magic wand and say the magic words arhus-barktum, capture the Sun. By moving the lens away from the paper, an image of the Sun, which is very hot, is drawn in the focus. The children should also try this by putting their palm on the picture of the Sun. Let's also try to burn the paper with the picture of the Sun.

Explanation: The sun is very far away, so with a converging lens its rays are collected in the focal point. All the lens-sized rays converge to a single point, so that point is very hot. It can even burn the paper (they try it themselves).

Conclusion: with the lens we help ourselves to see better (glasses).

4TH SET

Production of coloured glasses



By making coloured glasses, we want to encourage the child to be creative and train his manual skills. In the end, he gets a product that he uses for his experiments and observation of the surroundings. With glasses, he sees the world in colours without colouring objects and at the same time notes how light colours mix with each other.

Implementation: To make it, we need thicker paper (shell hammer), on which the children draw glasses according to the template and cut them out. In place of the lenses, cut out squares of coloured transparent paper (blue, yellow and red wrapping paper) are glued.

We look at objects of different colours through coloured glasses. → We see objects in colours that are different from the real ones.

Explanation: Coloured paper lets in only the colour of objects that is the same as the colour of the paper, it retains (absorbs) the other colours. Therefore, objects that have the colour of the glasses are bright, the rest become darker. Objects of complementary colours can even become black.

Conclusion: Coloured glasses allow us to change the colour of objects without painting them. We see only those colours that catch our eye.

- **SECOND WORKSHOP – EXPERIMENTS WITH WATER**

Children love to play with water and already have many of their own experiences with its properties. At the workshop, we draw their attention to these known properties and encourage them to observe phenomena that take place according to natural laws. The emphasis is on the physical and chemical laws of water. Water is also chosen because it is always at hand and children can repeat the experiments themselves at home or while playing with friends.

The first five minutes are used for motivation through questions and a story about water (a Slovenian fairy tale). After the fairy tale, the children are divided into groups of three to four in one group. Each group does its own set of experiments. Every 20 minutes, the groups change each other, so that all the children perform all the prepared experiments. Four lots are expected to be prepared. Adults guide the children through the experiments.

1ST SET

Swimming on the water

- Various objects are dropped into the water -> objects sink in the water, swim on the water or float

Implementation: Children sprinkle each object with magic powder and predict whether the object will float or sink. The object is dropped into a larger container (bucket) which is half filled with water. For a correct prediction, they receive a "five" from the mentor. They gradually drop various objects made of plastic, metal, stone, ceramic, styrofoam, wood, etc. into the water. We recommend that you also use fruit or vegetables and a hollow metal (ceramic) object that floats. Then have them pick up the objects from the water and arrange them into three groups: swims, sinks, floats.

Explanation: According to the density of water, a body swim, if its average density is less than the density of water, it sinks, if its average density is greater than the density of water, it floats, if its average density is equal to the density of water.

Conclusion: Man swims because the body is mostly water, and the air in the lungs reduces the average density of our body.

2ND SET

Changing body density

- Cartesian diver → Can float or sink.

Implementation: Fill a transparent liter bottle with water up to the top. Drop a glass dropper (from medicines) into it, which will serve as a Cartesian float. Before we put the dropper in the water, silently whisper magic words to it and tap it with a magic wand. The dropper should have air in it so that it floats on the surface of the water. Close the bottle firmly together with the dropper. If we squeeze the walls of the bottle, the dropper starts to sink, when we release the pressure with our hands, the dropper rises.

Explanation: Air is trapped in the glass dropper, so its average density is less than the density of water -> the dropper floats. By squeezing, we increase the pressure in the bottle, so the volume of air in the dropper decreases and some water enters it. The average droplet density increases. A dropper sinks when its average density is greater than the density of water. When we stop squeezing the bottle, the pressure in it decreases and the volume of air in the dropper increases.

3RD SET

Water pressure increases with depth

- Pour water up to the top into the bottle with holes. → Water flows out of the holes in the bottle at different speeds (the jets are of different lengths).

Implementation: Make vertical holes in the bottle (1.5 l) (5 cm, 10 cm, 15 cm and 20 cm from the bottom of the bottle). The holes should be about 0.5 mm thin. Use a sewing needle to make holes. Holes are made very well if you heat the sewing needle with a lighter (hold it with pliers) and then make hole in the bottle with the hot sewing needle. We catch the water flowing out of the bottle into a low and wide container. Pour a little magic powder into the bottle. Pour water into the bottle and observe the jets of water coming out. What happens if we twist the cap when the bottle is still full of water? How does the flow change if the stopper is screwed in only when the water level is lower than the highest hole?

Explanation: When the water reaches the top of the bottle, water flows out of all the holes. The longest stream is from the bottom hole, because there is the highest water pressure (the upper layers of water press on the lower ones) and therefore the speed of the water outflow is the highest. As the water flows out, the water level is lower, so the pressure decreases at all holes and the length of the jet also shortens at all holes. If the bottle is closed with a stopper while it is still full of water, the water stops flowing out because the water pressure is lower than the air pressure.When the water level is below the first hole, there is no change in the flow of water through the other holes because air can enter the bottle through the upper hole.

Conclusion: Water pressure increases with depth, so divers need special diving equipment. If you do not equalize the air in your ear, your eardrum can burst when diving to a greater depth. We live at the bottom of a deep sea of air, so air pressure decreases with altitude. In high mountains (Himalayas), mountaineers have difficulty breathing because the air is thinner.

A hole, but still holds water

- Cover the glass with water with paper and quickly turn it over. → The water stays in the glass, it does not run out.



Implementation: Pour water up to the edge in a jar glass and cover the surface with paper. We tap the paper with a magic wand and say: water sticks to the glass. Cover the paper with your palm and turn the glass of water quickly so that no air gets into the glass. We take our hand away from the paper and the water really stays in the glass. We repeat the experiment with a piece of cloth. Before the experiment, we show that if we pour water on a piece of cloth, the water passes through. Before we turn the glass over, we tap on the glass and say: glass, you must not pour water. Tip: the piece of cloth should be made of cotton and should extend 1 cm to 2 cm beyond the rim of the glass. We always press the top against the glass, but due to the weight it does not let air under the piece of cloth. The piece of cloth must get wet and there must be no air under it -> this can be prevented by pouring additional water on the cloth over the covered surface of the water and letting the air out. If we wait for a while, a little water will run down the piece of cloth and it will spread nicely on the surface. The experiment can also be performed with a sock.

Explanation: We use the paper to prevent air from entering the glass, so there is a vacuum at the bottom of the glass. The paper is only pressed by the water in the glass, the pressure of which is small (shallow depth of water). From the opposite side, air pressure presses on the paper (we are at the bottom of the air sea), which is much greater than the water pressure, so the paper presses on the water like a stopper. Water does not flow from the glass. The water would leak out if you let air into the glass. When we cover the water with a piece of cloth, the result is the same as with paper. Water cannot flow through it because the air pressure prevents it. Air cannot enter the glass through the holes in the piece of cloth, because the surface tension of the water prevents it.

Conclusion: In order for the water pressure to equalize with the air pressure, the depth of the jar should be about 10 cm. We use this research successfully in canning. Turn the hot jar with jam or compote onto the lid (there may be some air in the jar) and let the jar cool. The resulting vacuum strongly seals the glass and prevents the development of microorganisms.

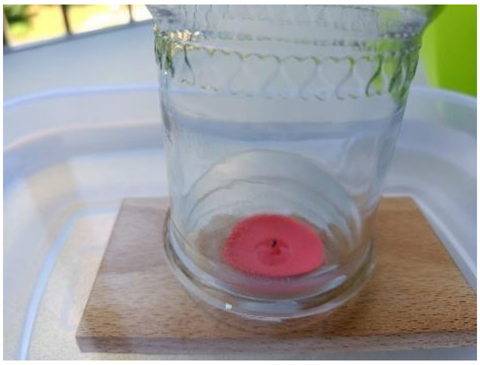
➢ THIRD WORKSHOP – AIR

At the third workshop, we present the properties of air to the children through experiments. They already have experience with air, but they arenot aware of the air itself, because they cannot see it or feel it. We assign the role of magicians to children. After the creative workshop, the children start experiments and each time before the experiment "succeeds" they use magic words (Cira chara chiribi, candle stop burning).

1ST SET

There is oxygen in the air

- Cover the burning candle floating on the water with a glass for soaking. → The candle goes out, the negative pressure pulls the water into the glass.



Implementation: Pour water into a wide and low container. Place a burning candle on the floating board in it. Tap the glass with the magic wand and say the magic word: hocus pocus, glass drink water. When the candle is covered with a glass, it burns for a while and goes out when it has used up the oxygen. Water collects under the connected glass.

Explanation: When a candle burns, oxygen is consumed and carbon dioxide is produced, which has a smaller volume than the original oxygen. Due to the negative pressure in the glass, the water enters the glass.

2ND SET

We increase the air pressure with force

- Hit the bottle on the walls. → The stopper flies into the air.

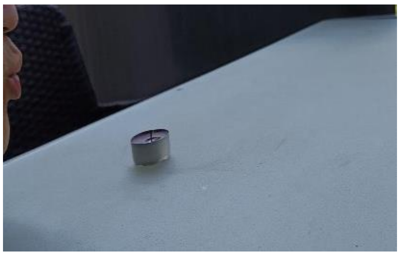
Implementation: We use a bottle of liquid washing powder, which has an extended stopper. Place the stopper in the throat and do not twist it. Stroke the bottle with your hand and say the magic word arctus-barktum jumps into the air. Hit the walls of the upright bottle with both hands at the same time and the stopper flies high into the air.

Addendum: With the stopper fired from a horizontally lying bottle, we try to knock down a tower of yogurt pots, which is about 3 m away.Explanation: Hitting the wall increases the pressure in the bottle, so the stopper flies into the air.

3RD SET

Wind is the movement of air

We make wind by blowing. → Blow out the candle so that it blows out.


Implementation: Light a candle and let the child blow it out. In the next step, he must blow out the candle through the funnel. Before blowing through the funnel, sprinkle the funnel with magic powder. Normally, it will not blow out the candle.

Explanation: When blowing directly, the air jet is straight. With a funnel, the air stream is distributed along the walls of the funnel. Therefore, the child will only blow out the candle if the edge of the funnel is next to the candle.

Pinwheel

- We make a paper pinwheel

Implementation: Cut a square out of A4 format and fold it along both diagonals. Use scissors to cut diagonally towards the center to about ¾ of the diagonal. We bend this part of paper towards the middle and glue them. The tip of each part of pinwheel should extend about 1 cm beyond the middle. Pin the resulting pinwheel to a wooden stick (skewer stick) with a pin. If we insert a paper circle, about 2 cm in diameter, in front of and behind the pinwheel, the pinwheel will rotate more easily.

Explanation: The pinwheel is turned by the force of the wind.

FOURTH WORKSHOP – SOUND

Sound represents mutual communication between people. Even animals communicate with each other with voices. The workshop is aimed at getting to know how sound is created, how sound spreads, how we hear sound. Some simple folk instruments are supposed to be shown.

1ST SET

The generation of sound and its waves

- Clap your hands
- Beating with bottles
- Singing

Implementation: after three suggestions for the creation of sound, let the children "invent" their own sound. Reserve: playing on a glass, sound from a bottle or pipe, beating on wood or a drum, playing on a comb, whistling on the grass between the fingers, ...

Explanation: Sound is produced by vibrations of the sound system.

2ND SET

Sound is a wave

- We speak into the yogurt pot -> the walls of the pot shake
- Touch the surface of the water with the tuning fork, which oscillates and creates waves

Implementation: Tap the yogurt pot lightly with a magic wand. They should gently hold the yogurt pot and speak loudly into it. They feel the walls of the pot vibrate.

Explanation: Sound is transmitted by waves through a medium (air, water, metal, ...). On the moon and in space where there is no air, we cannottalk (astronauts). There is complete silence.

3RD SET

Playing the elastic band and other folk instruments

- By stretching the elastic, the tone of the elastic's voice changes

Implementation: Three identical elastic bands are strung on nails with different distances on the resonance box. The tone changes with the tension of the elastic band. The tighter the elastic, the higher the tone. It's the same with the guitar.

First, we prepare a bottle or box from which we remove the label (paper). Then cut out a rectangle or square in the middle. Stretch elastics over the cut square or rectangle. We stretch the elastics over the square or rectangle so that there are spaces between the elastics (so that the elastics are not too close together). We strum the elastics (strings) the way we strum a guitar. If the elastics are tensioned differently (with the help of spacers), the sound of each string can be changed.

Folk musical instruments: ragla, nunalca, whistle, pottery water flute, ribežen



Explanation: All musical instruments produce sound with vibrations that travel through the air.

Children are specially introduced to nunalca. It is a simple folk instrument that can be made from hollow natural material (corn stalk, bamboo, dried rhubarb...). To make it, we also need baking paper', elastic or natural binding material, and an electric drill. Children get approx. 15 cm long hollow cylinder, with the support of the mentor, they make a hole through one layer of the cylinder. They cut out the baking paper themselves approx. 10x10cm and used to close one side of the hollow cylinder. The paper is attached to the roller with an elastic band or some other natural binding material. The nunalca is played by holding it to the mouth with both hands and humming into the hole. The melody we sing into the instrument has a humming sound.

4TH SET

Telephone

- They make a phone out of string and yogurt pots

Implementation: Make small holes in the middle of the bottom of the yogurt pot . Put rope that is 2 mm wide and a length of 10 m through the hole, so that the ends of the rope are each inside their pot, and the rope that connects the pots to each other is left on the outside of the bottom. At the end of the rope, make a knot that prevents the rope from slipping out of the pot. We tighten the rope and on one side of the rope a child speaks into a pot, on the other side of the rope another child listens through another pot. They exchange roles and talk. Others nearby cannot hear the conversation. Also try to transmit silent speech.

Explanation: The voice vibrates the walls and bottom of the pot. The vibrations are transmitted through the rope to another pot, which vibrates and transmits the sound through the air to the ears. The children can take home the phones they made.

The meeting ends with the children teaching the elders songs and singing together.

FIFTH WORKSHOP - MAGIC

At the last meeting, we organize a fun magic show for the children. Tricks are based on the basic laws of physics.

1ST SET

Faraday cage

- We place the mobile phone in a metal box and close it. → The mobile phone stops ringing (working).

Implementation: We do the trick for the whole group together, because all the children themselves don't have phones yet. Place the ringing telephone in a metal box and close it. The phone rings for a short time and then goes silent. When we call him again, the secretary says that there is no connection. When we take the phone out of the box, it soon connects to the network.

Explanation: The metal box represents a Faraday cage that does not allow the electromagnetic waves of the mobile phone to pass through. Since the cell phone in the metal box does not receive a signal, it cannot communicate with the network, so it stops working. Some metals do not transmit electromagnetic waves.

2ND SET

Egg tricks

- Light a fresh egg. → It reflects light.
- Drop a fresh egg into the water. → The egg sinks in the water.
- Separation of fresh and boiled egg by rotation.
- Add salt to the water containing the egg. → The egg floats to the surface.

Implementation: Sprinkle the eggs with magic powder. Light the fresh egg from behind. We can use the flashlight on the cell phone. Light passesthrough a fresh egg, but not through a cooked or rotten one.

Drop the eggs into the water. If it is fresh, it sinks, if not, it floats in the water or even swim.

Spin the fresh egg like a top. A fresh egg spins slowly with difficulty. When we spin a boiled egg, it spins hard and at a high enough speed it even spins around the tip of the egg.

Explanation: In a fresh egg, the proteins are not curdled, so light passes through and sifts the egg.

A fresh egg is denser than water, so it sinks. Since the shell is not completely impermeable, sometimes some of the liquid evaporates and a gas bubble forms on top of the egg. Due to the gas in the egg, the average density of the egg is less than water and the egg floats. It floats so that the air bubble in the egg is at the top.

With a fresh egg, it is difficult to get the liquid in the shell spinning because there is not much friction between the layers. In a boiled egg, the proteins are mutually accepted, so the layers in the egg do not slide together. The cooked white and yolk are stiff, so the egg can be spun.

3RD SET

Persistence

- The yogurt pot slides on the floor due to the persistence of the ball under the yogurt pot.

Implementation: Push the yogurt pot on the floor. The pot soon stops. Sprinkle the pot with magic powder and hide a larger metal or stone ball under the pot. We push the pot and it miraculously slides across the floor far across the room.

Explanation: An empty pot stops quickly due to friction. If there is a heavy ball under the pot, it has great persistence and pushes the pot forward. The friction of the pot is not expressed.

Knocking out coins from under a pile with a knife

Implementation: stack coins on top of each other (about 10 coins). We sprinkle the magic powder and say the magic words: chira - chara - chiribi, calm down the pile and gift me with a coin. With the back side of the knife (not the blade), knock out the coin that is on the ground one by one. If we hit with enough force, the coin flies out of the pile, but the pile does not collapse.

Explanation: Bodies remain in their position if no force acts on them. When the coin is ejected fast enough, the friction between the coins is too weak to move the whole stack, so it stays in place. Thus, we can gradually knock out the bottom coin, one by one.

If you quickly remove the paper from under the coin, the coin stays in place (falls into the pot)


Implementation: You place a coin on the paper lying on the table. You touch the coin with the magic wand and say the magic words: hocus pocus, the paper is mine. If you quickly remove the paper from under it, the coin will remain in the same place on the table, and the paper will remain in your hands.

Explanation: When the paper is quickly removed, the coin is not subjected to a force large enough to move the coin, so it remains in place. It stays put, and the paper is in our hands. In taverns, this trick was performed by placing the paper over the glass (or the neck of the bottle, which madethe trick more difficult) and competing with each other to pull the paper fast enough for the coin to fall into the glass (bottle).

4TH SET

We measure time with an hourglass

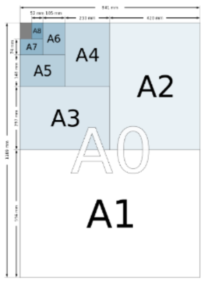
- Making hourglass (corn or wheat semolina) for cooking an egg.

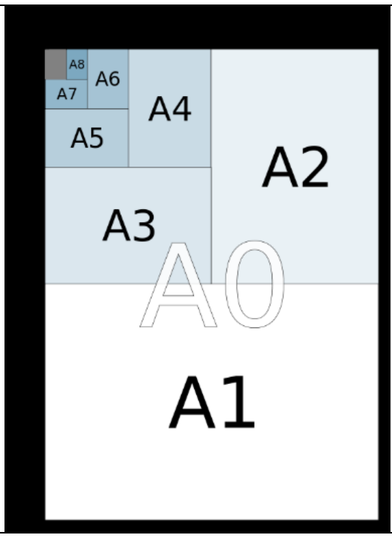
Implementation: Finally, we invite the children to find out how they could measure the duration of time without a wall/hand clock. Let's involve them in making an hourglass with which they will measure 3 minutes (the time needed, for example, to prepare soft-boiled eggs). Each child is given two identical 0.5 liter transparent bottles with caps. We hand over a certain amount of semolina or sugar. With the support of their mentors, the children glue the caps together and drill a small hole through the glued caps. The hole is sanded around the edges. Both bottles are screwed onto the glued caps. Pour semolina or sugar into one bottle of yarn. They adjust the amount until they find out through experiments how much semolina/sugar they need for 3 minutes. Through observation and trying, the children come to their own realizations that making an hourglass in 3 minutes depends on the size of the hole in the cap and the amount of semolina or sugar.

3.1.3 Products and materials needed for manufacturing

For a group of 25 children. The work at each workshop takes place in several groups, namely in such a way that the children circulate in groupsand get to know all the experiments and are involved in the production of all didactics.

Material/tool	Picture	Number of pieces
Access to water and natural light	 	/
Jar glass (large and small)		2 of each
Coins		10
Wooden stick		2
Bird Feather		2

Flashlight or cell phone		1
Spray Bottle		1
Dish Detergent		1
Spinner		4
A4 white paper		10

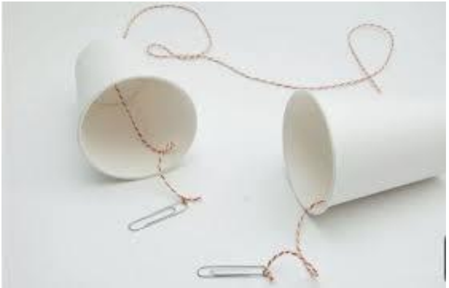
Bottle 1.5 L		8
Bottles 0.5 L (each person needs 2 bottle for an hourglass)		50
Newspaper		2
A magnifying glass		1
Hard paper A1		20

A pencil		5
A coloured wrapping paper (blue, yellow and red)		One roll of each color
Larger plastic container/bucket		1
Wooden pieces, fruits, vegetables, styrofoam, plastic figures, metal figures	/	15 different items
Glass dropper		2
Sewing needle		2
Lighter		2

Cotton cloth		1
Wooden tile		2
A candle		4
Low plastic container		1
Metal cookie box		1
Cell phone (working)		1

Eggs		10
A ball of metal or stone		4
Knife		1
Wheat semolina		cca. 200 g for each child
Hot glue gun and hot glue sticks		1 gun and 10 sticks
A glass		2

Washing liquid powder bottle with lid		2
Funnel		2
Scissors		4
Drawing pins		25
Skewer sticks		25
Yoghurt pots		4

Cord		3 m
Elastics		100
Resonance box		1
Box of tissues (each child needs one box)		25
Bamboo dry sticks/Corn stalk dry		25
Baking paper		3 m

3.2. Multigenerational activity: Create a Colourful Volcano

3.2.1. Aim and purpose of multigenerational activity

"Make a colorful volcano" program was inspired by the fact that the Troodos mountains are unique in their geology and one of the only few places in the world where scientists can examine oceanic crust without needing to go to the sea. An underwater volcano that erupted 90 million years ago, and the reason the island was formed, has given rise to pillow lava which is observable throughout the mountains. More information can be found here (https://www.chooseyourcyprus.com/destinations/troodos-mountains.html).

The program is built on the strengths that different generations have to offer, nurture understanding and mutual respect and challenge knowledge through science experimentation.

3.2.2. Description of the manufacturing

1ST WORKSHOP

Get to know what is a volcano view video (https://www.youtube.com/watch?v=lAmqsMQG3RM) and review the Troodos mountains website information (https://www.chooseyourcyprus.com/destinations/troodos-mountains.html).

Create homemade play dough to make the volcano mountain. Recipe add 1 cup of cornstarch, 2 cup of backing soda and 1 to 1,5 cup of water. Mix well all together to from the dough. Divide dough in 5 cup and add food coloring to create 5 shades of colorful dough (red, blue, yellow, orange, green).

2ND AND 3RD WORKSHOP

To create the vulcano, children have to work in small groups.

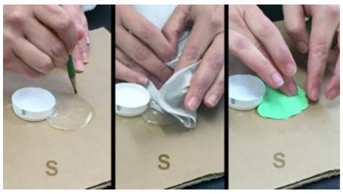
- 2 children to create the base of the volcano with aluminum baking sheet and cut the paper cup and glue it on the base of the volcano.
- 3 children to create the eruption by pouring baking soda and some vinegar (to represent the lava), children can change groups so every participant would be a part of the whole process.

1st Group: Cut recycled cardboard and put on top of an aluminum baking sheet. Cut off the top of the paper cup so it's only about 1-2 cm tall. Place the paper cup at the center of your piece of paper and trace around the bottom to make a circle. The circle and the cup represent the crater inside your volcano. Glue the cup to the piece of cardboard. Mark north, east, south and west on both the the cardboard.

Create 10 test cups from 0,50L plastic bottle by cutting it in half. You can use both parts of the bottle to collect samples. (to use in 4th workshop)

2nd Group: Fill the cup with a spoonful of baking soda. Then, slowly pour in enough vinegar to make the mixture foam up and flow out of the cup. This simulates an eruption and lava flowing out of your volcano,watch the crater erupt outside the paper cup and dab up the fluid with a paper towel.

Form the lava flow on an A4 sheet of paper, using a colored pencil to trace around the edge of where the lava flew out of your volcano. Then, cover the area inside the line you traced with a thin layer of one color of play dough to mark where the lava flowed. Repeat the process of eruption with different colors of play dough layers until you don't have any play dough left.



4TH WORKSHOP

Field work outside in nature or garden. Assign who is responsible to collect each type of soil in different half cut 0,50L bottles, each bottle must contain one type of soil sample. Collect small rocks, soil mixed with small rocks, soil, soil mixed with organic matter (dry leaf).

5TH WORKSHOP

Build layers of soil in plastic bottle as shown on the image above (soil layers on earth). 1st layer rocks, 2nd layer soil mixed with small rocks, 3rd layer soil, 4th soil mixed with organic matter (dry leaf). Compare the samples. Try to layer the soil samples on the volcano experiment with the play dough and build each layer.

3.2.3. Products and materials needed for manufacturing

Tools		Number of pieces
Heavy duty scissors		2
science glass magnifiers		5

single use plastic gloves		1 pair
food coloring		4-5 shades
water		1,5 L
Cornstarch		1 box
Cutting blade		1
12 Colored pencils		1 box
small shovel		1

Play dough cups (at least 5 colors)		5
Paper glue		1 small bottle
Baking soda		1 box of at least 500g
Bottled white vinegar		1 liter
Kitchen paper towel		1 roll
Reusable teaspoon (plastic or wooden)		1

Aluminum baking cookie sheet (maximum 30x40 cm)		2
Recycled card board (maximum 30x40 cm)		2
Paper cup		1
protective science safety equipment (glasses)		1
plastic bottle 0,50L (once divided in half, result 2 plastic bottles)		1

3.3. Multigenerational activity: Small Sustainable Farm

Through this program, children will learn how to convert water energy into electricity, about water pressure and how to make constant water circulating in this way. The water roundabout uses the under pressure to start the water wheel in order to transfer its energy to the generator to generate electricity. It's a path of sustainable energy. Together with the seniors, preschool teachers and adult educators, children will create water tower, a water wheel and a small farm with animals. The small farm produces its own electricity, which it receives from its power plant. We will make the house and barn from a carton of packaging (tetra pack). Children can draw the farm animal or cut it from the photos and put on a small stand of cardboard tubes of toilet paper.

3.3.1. Aim and purpose of multigenerational activity

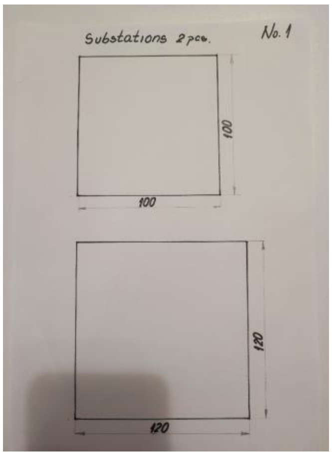
We decided on this topic because in Croatia we had an excellent inventor, Nikola Tesla, who is meritorious for many of today's technological inventions. He was born in the Austrian-Hungarian Monarchy in 1856., in the village of Smiljani, on the territory of the Trident Kingdom of Croatia, Slavonia and Dalmatia, today's territory of Croatia (Lika). Tesla often said, "I am proud of my Serbian origins and Croatian homeland." As a child, Nikola observed nature and its power, learned from nature. As a boy, Nikola Tesla showed imagination, even then he came up with some minor inventions that we had never heard of. At the age of five, he began to make his originally designed inventions. He built a small water wheel, different from the ones he saw in his area. The water wheel was smooth and without oars, but smoothly turns under the water flow. Tesla is known for using water energy to generate electricity. The   world's first hydroelectric power plant at Niagara Falls was designed by Nikola Tesla in 1893. https://www.teslasociety.com/niagarafalls_tesla.htm Due to these facts, the Croatian team decided to build a water wheel for electricity generation. We will create a water roundabout uses the under pressure to start the water wheel in order to transfer its energy to the generator to generate electricity.

The aim of this program is the development of children's motor, social and communication skills, as well as cognitive development. The goal is driven interest in mechanics, technology, and engineering, in one acronym STEM. Through this activity, children will learn about causal relationships, the conversion of water energy into mechanical energy and electricity. Children will learn about sustainable energy and Nikola Tesla, the great inventor. They will   play with water, learn about water pressure, electricity and farm life. If you want to get to know Tesla better you can visit the Nikola Tesla

[Memorial Center https://mcnikolatesla.hr/en/](https://mcnikolatesla.hr/en/), or the Technical Museum [https://tmnt.hr/hr-hr/nikolatesla.](https://tmnt.hr/hr-hr/nikolatesla)

3.3.2. Description of the manufacturing

The Water Tower

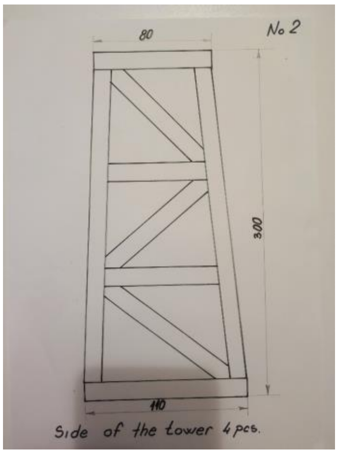


To make a water tower you need a plastic bottle, a pack of flexible straws, 2 packs of wooden tongue depressors (spatulas), plywood base with a thickness of 4 mm, a PVC container 60x40x10 cm, Wurth fast-drying glue. It is necessary to saw two wooden bases made of plywood. You can see the dimensions of the substation in sketch 1. Then make a tower out of wooden spatulas as the picture shows. You can see the dimensions of the tower in sketch no.2. You connect wooden spatulas with quick-drying wood glue. First you need to make supports (pillars) that you connect to each other every 10 cm, according to the sketch. When the support is finished, you need to attach it to a wooden base using a thermo gun.

Connecting the straws on marked places.

Put a plastic bottle on the support tower and glue it to the wooden base with a thermo gun. On a plastic bottle, drill one hole at the bottom of the bottle to put a straw in it. Drill the second hole on top of the bottle on the other side of the bottle and also insert a straw there. Seal it the straws with thermo gun.

You need to extend this straw to the base of the tower, inserting a straw into the straw. How it works you can see [here](#).

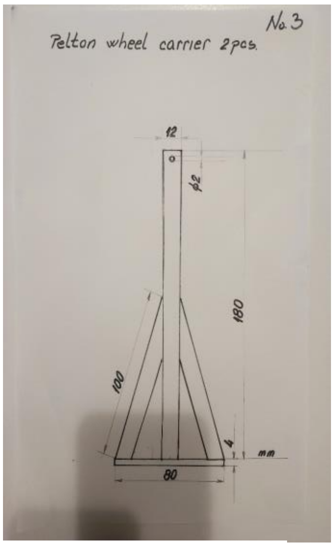


Sketch 2

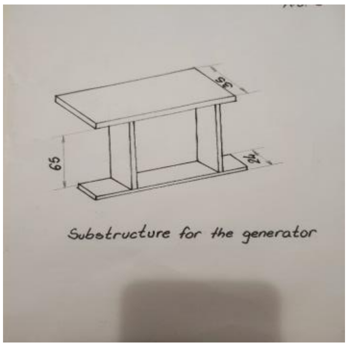
The Water Wheel

The water wheel is made of plastic plugs, wooden/bamboo skewers, steel axle diameter 2mm, wheel carrier (2 pcs) and 2pulleys diameter 42 mm, pulley belt, electric motor 9V, bulbs 1.5V, electrical wires, wooden bases (supports), wooden spatulas. Required for production: soldering iron, soldering wire, fast-drying glue for wood, thermo gun.

Saw the wooden base and make a 2 carrier for the axle of the water wheel. The carrier dimensions for the water wheel are on the sketch No. 3. After making the water wheel carrier, it is necessary to make a substructure for the generator according to sketch No. 5.

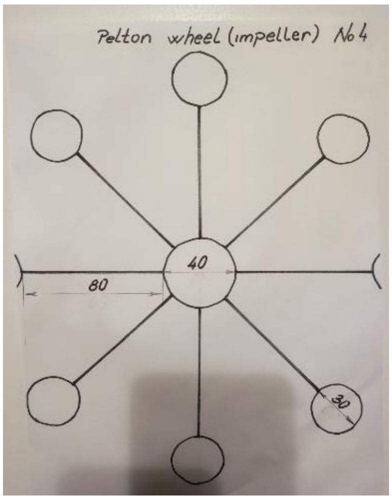


Sketch 3

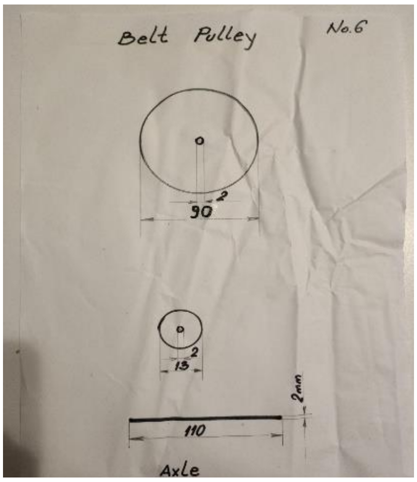


Sketch 5

At the edges of 8 plastic plugs drill one hole each using a soldering iron or small drill. Put the skewer sticks in the hole and glue them with a thermo gun to the plastic plugs. The length of the skewer sticks is 80mm. Take two same plugs and drill on the edge of 8 holes using a soldering iron or drill. The distance between the holes must be the same for every one of eight sticks (octagon). Finally drill one hole in the middle of the surface of both plugs. In 8 holes on the edge of plug insert sticks with glued plugs and glue them with a thermo gun. Other plug cut on half and glue it as a lid on first plug with skewers. Through the hole in the middle of the surface of plug slide the axle diameter 2 mm. Drill the holes on the top of the carriers, and place the axle in it. The stoppers on the axle are made of wooden beads or children's beads in the colors. Put the pulley on the shaft and connect it with a rubber belt with pulley on electromotor which one will have to role generator. Light bulbs connect with electric wires and generator using a soldering iron. Light bulbs place for the light in the country house and barn. For creating this use sketch No.4 and No. 6. The devices have to be put into the plastic container, and pour water into the bottle and container. The water wheel and electric generator are ready to work.



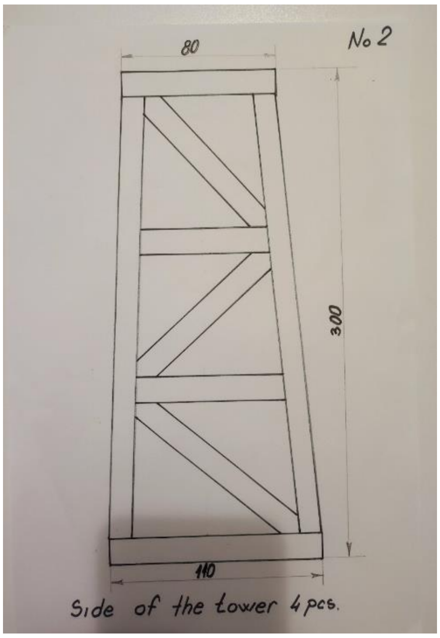
Sketch 4

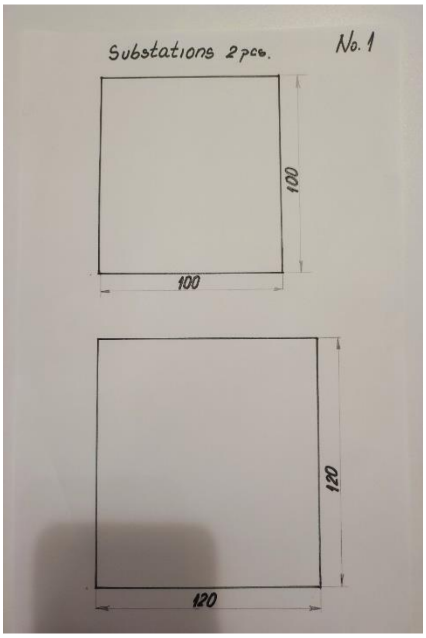


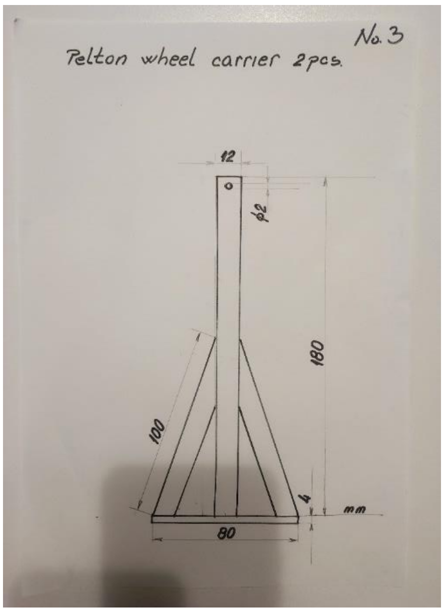
Sketch 6

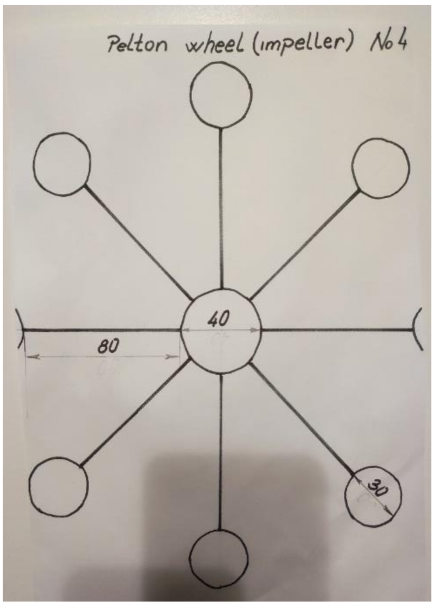
Construction of a solar power plant

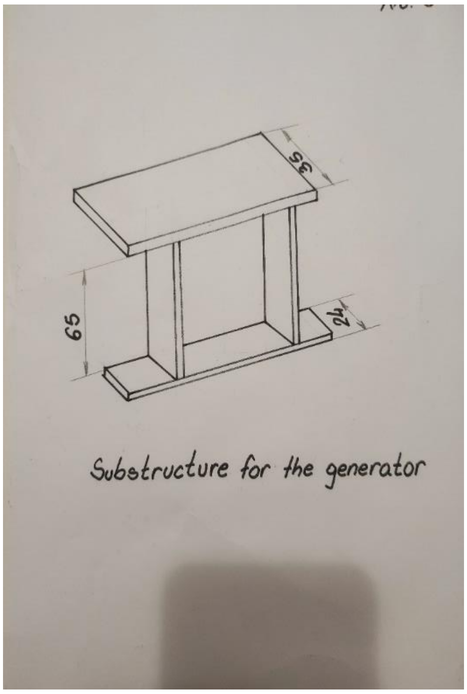
We make the solar power plant from solar panels that we glue to the box in which the rechargeable batteries are placed. We put it all together on the water tower and connect the rechargeable batteries to the water pump with a wire via a switch.

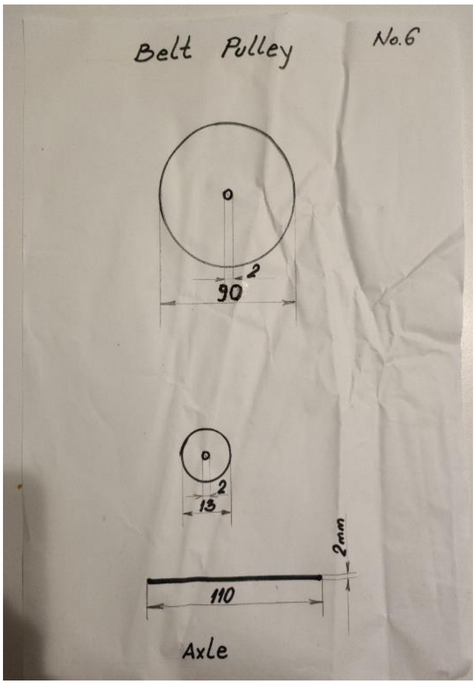












Making a Farm House and Barn

Take the old and washed carton/tetra pack packaging of juice or milk packaging. Using a scalpel, cut the doors and windows into the carton as you like. Paint the carton packaging as you like to complete your house and barn. You can build as many houses and stables as you want.

Making a Paper Figure of Domestic Animals

Use cardboard or stronger paper to draw animals. After you draw the animal, you can cut it with scissors. The child can draw an animal or cut a picture of a domestic animal, glue it to cardboard and put it on the base of a cardboard tube of toilet paper. A cardboard tube of toilet paper is cut to a height of 4 cm. On it we carve two grooves into which we will insert an image of the animal so that it can stand independently in space. The image of domestic animals can be found on Pinterest. You can copy images of domestic animals copy on A4 paper, enlarge them and print them. Children can cut them out. Cut images can also be plasticized if you wish.

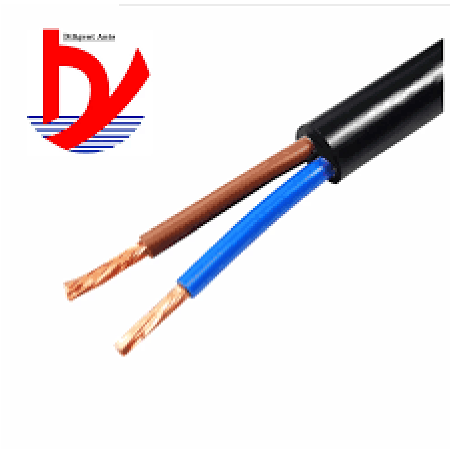
The farm house, barn and animals have to be put into plastic container full with corn kernels.

3.3.3. Products and materials needed for manufacturing

Tools		Number of pieces
4 Strong scissors		4
1 ruler, 1 roll meter	 	1 1
3 Scalpels		3
6 Color brushes, wide		6
60 ml of each Acrylic color (yellow, green, red, blue, purple, pink, orange)		60 ml of each color
4 Carton packaging of different dimensions		4
1 thermo gun + plastic inserts		1

2 Fast-drying glues 50 g		2
2 boxes of Wooden throat spatulas		2 boxes
1 Plastic bottle – 1 l		1
1 package of Flexible straws		1 package
2 PVC tanks 60X40X10 cm		2
1 Modeling saw and saw blade		1

10 Plastic plugs		10
1 package of Skewer sticks		1 package
1 Soldering iron		1
1 welding wire 20 cm long and 2 mm thick for the shaft		1
Scissors for cutting steel wire		1

9V DC Micro electric motor for toys		1
1 m in length Power wires 0.5 mm²		1 m in length
2 Bulbs 1.5 V		2
1 m of Soldering wire		1 m
Rubber strap		1

2 Pulley 15mm+90 mm		1
3 Pearls		3
10 Cardboard tubes of toilet paper		10
3 kg of Corn kernels		3 kg
Aquarium pump		1

Solar cells		1
Rechargeable batteries and a box for them.		4
Mini circuit breakers		2

3.4. Multigenerational activity: A Balance Scale

3.4.1. Aim and purpose of multigenerational activity

The goal of the multigenerational mentoring programme is the development of the child's manual and mental skills.

The scale will be made of wood and various waste materials. When making a scale, children will learn about different tools and materials and how to name them correctly. The children will make the scales with the help of senior mentors. They will be able to make it individually or in a group thus learning teamwork, tolerance and division of labour.

When making a scale, children will learn about each individual work operation that is required to manufacture it. With the help of mentors, they will cut the base of the scale, measure and saw the pillar, pillar support and the beam. Under supervision, they will learn the correct use of various tools and their names. The children will sand the sawed-off pieces of wood with sandpaper. The obtained components will be connected into the final product with the help of screws and the use of various tools (drills, screwdrivers, etc.).

The children will make two weighing pans from an old ball using the paper mache technique. Mentors will wrap the ball in cling film. The children will then cut the ball in half, tear the newspaper, apply glue to the ball and stick pieces of newspaper on it. The process will be repeated several times. The dried final product will be removed from the ball, the children and the mentors will then make three holes in each one of them and apply a piece of string through it.

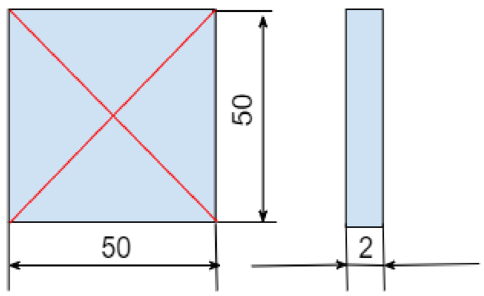
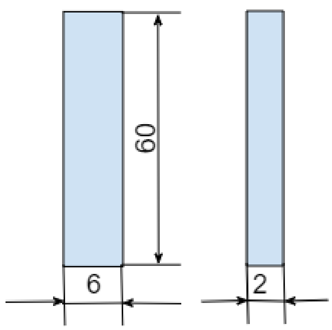
At work, children will develop and strengthen manual skills, planning skills, develop cognitive processes, mathematical thinking, and accuracy.

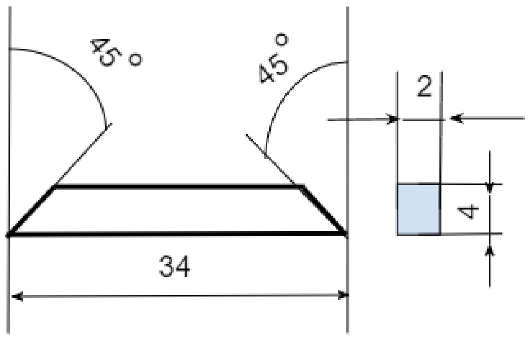
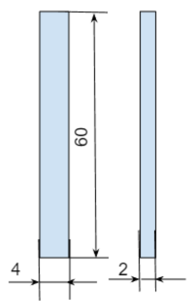
Children will be able to draw and paint designs according to their wishes on the base of the scale and on the pans for the scale. At the same time, they will develop manual skills, precision, strengthen creativity and imagination.

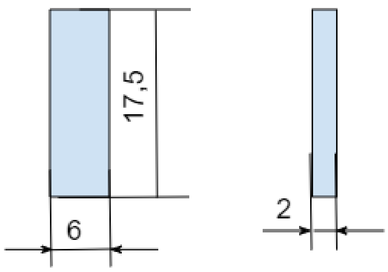
By playing with the scale, the children will learn about the basic unit of mass - a weight of 1 kilogram and they will also learn to name it.

They will realize that a kilogram of different things varies in quantity (rice, flour, apples, candy ...).3.4.2.

3.4.2. Description of the manufacturing

DRAWING	MANUFACTURING DESCRIPTION	INSTRUCTIONS
BASE *A drawing with measurements* 	- marking the center of the base - drawing and colouring of the design for the base of the scale	- opposite corners of the base are connected with a ruler - a child draws a line along the edge of the ruler -the process is repeated for the opposite corners, so that the centre of the base is marked -The children decide on the design for the base and draw and colour the design according to their wishes
PILLAR *A drawing with measurements* 	- measuring - marking - sawing -sanding -drawing -painting	-a child, together with an adult, measures the length of the pillar on the spruce slat and draws a line at a certain length (according to the plan) - a child then cuts the slat with the help of an adult with a hand saw according to the plan

		- the children sand the rough parts of wood with sandpaper - the children embellish the pillar with a design of their choice.
PILLAR SUPPORT *Drawing with measurements* 	-measuring - marking - sawing -sanding -drawing	- a child, together with an adult, measures the length of the pillar support on the spruce slat and draws a line at a certain length (according to the plan) - the child cuts the slat with the help of an adult with a hand saw according to the plan - the children sand the rough parts of wood with sandpaper
BEAM *Drawing with measurements* 	-measuring - marking - sawing -sanding -drawing	-a child, together with an adult, measures the length of the beam on the spruce slat and draws a line at a certain length according to the plan, - the child then cuts the slat with the help of an adult with a hand saw according to the plan,

		- the children sand the rough parts of wood with sandpaper
A SLAT SPACER *A Drawing with measurements*  	- measuring - drawing dots for drill holes -drilling	-a child, together with an adult, measures and determines the place of the screw on the slat spacer and draws a dot, - a child tries to drills a hole with a hand drill then finishes together with an adult using a cordless electric drill -an adult finishes drilling an electric drill.
ASSEMBLING ALL THE PARTS INTO THE FINAL PRODUCT – A SCALE *A drawing or picture of the scale made* 	-assembling -drawing dots for drillholes -drilling - screwing	-a child, together with an adult, determines and draws the centers of the components, - with the help of an adult, the child tries to drill a hole and screw in the screws and assemble the scale

PLAYING WITH THE SCALE *Original weight of 1kg* 	-weighing -adding -subtraction -comparison	-The children with the help of the adults write down their current knowledge and observations about scales and weighing on a poster -Then they get to know and handle the original weight of 1 kg and learn to name it correctly. -using manipulation and practical work, they weigh different materials compared to the basic unit of 1kg -The children choose the material themselves, add, subtract and compare it. Adults encourage them to be verbally active. - After a longer and repeated activity, the children complete the poster with new insights and terminology.
WEIGHING BASKET/PAN *Drawing with measurements* 	-applying glue - tearing of paper -gluing -applying paper mache technique - measuring the string -manipulation with the resources	-An adult marks half of the ball with a marker, -then the adult wraps the ball with a cling film, - a child tears up a newspaper to pieces of about 10 cm in size. - A child covers part of the ball with glue, -sticks the torn up pieces of paper on the glued part

		of the ball up to the marked part. - The half-finished product is left to dry. The process of paper application is repeated at each meeting. - The final, dried product is removed from the ball. -An adult marks and drills three holes in the paper mache pan, and threads 3 pieces of string of equal length through them. - Two semi-circular containers are hung onto the scale. - The scale pans can also be embellished with markers.

3.4.3. Products and materials needed for manufacturing

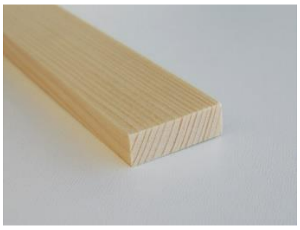
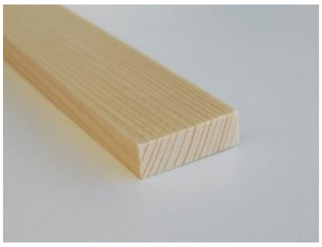
A long ruler	
A Pencil	

Markers	
Retractable tape measure	
Corner braces	
Saw	
Sandpaper	

Woodworking clamps	
A mitre box	
Hand drill	
Cordless drill	
Drills	

Protractor, set square	
Screwdrivers	
Weight 1kg 1 pc	
Reuse: transparent bucket (min 3L, max 5L) 2 pieces	
Plastic cling film	

Wood glue	
News paper	
A wide flat paint brush	
Permanent markers	
Scissors	
Synthetic string	

Spruce board 50x50x2cm 1 pc	
A spruce slat 6x200x2 cm 1pc	
A spruce slat 4x200x2cm 1 pc	
Metal corner braces 70x70x55 mm 2 pieces	
M8 x 80 screw 2 pieces	
Nut M8 2 pieces	

M6 x 30 screw 1 piece	
Nut M6 1 piece	
Wood screw M4 x 15 6 pieces	
Wood screw M6 x 30 6 pieces	

3.5. Multigenerational activity: Catapults

3.5.1. Aim and purpose of multigenerational activity

The goal of the multigenerational program is to help a child understand the basic concepts of physics and develop children' manual and mental skills. Games will show kids the science visually, which helps them understand the concepts. They will learn about projectile motion, will test different weighted items to see which ones fly further. Programme also aims to connect primary school kids and senior mentors in this process, so senior mentors can show and share their experience in this field.

Through the process children will learn basics of physics, for example something about Newton's Three Laws of Motion:

1) An object at rest stays at rest and an object in motion stays in motion with the same speed and in the same direction unless acted upon by an unbalanced force.
2) When an external force acts on a body, it produces an acceleration (change in velocity) of the body in the direction of the force.
3) Every action has an equal and opposite reaction.

Children will see how without touching the catapult, nothing happens. The ball is not going to launch itself without you applying force. They will see that when you pull back the spoon and let go, you overcome the ball's inertia and fling the ball into the air. The force of the spoon exerted on the ball produces acceleration upward and makes the ball fly into the air. The action of letting go of the spoon causes the reaction of the ball getting launched. Or you can build 2-3 different catapults and see which one works better or if one works better with different objects. As a follow-up activity, kids test how far catapult will fling different projectiles, such as marshmallows, pom poms, or erasers. Which will fly the farthest? Why does one fly farther than another? They can make predictions, test them, and record results.

3.5.2. Description of the manufacturing

1. First workshop: Different types of catapults made by kids. Sticks are painted according to the colors of the national flag.

   Targets are buckets. On the buckets are written numbers: 1, 2, 3, 4, ect. Task for the kids is to shoot and throw into the bucket as many balls as there are numbers written on the bucket. They can study counting on their native language/ on English etc. Also buckets can be different colors and kids study colors as well. It is possible to make competition between groups: who will shoot and throw quicker.

<u>**HOW TO MAKE A CATAPULT?**</u>

a) FIRST VERSION

Make a stack of 7 popsicle sticks and use rubber bands to tie them together on both ends.

Make a stack of 2 popsicle sticks and use a rubber band to tie them together on one end only.

Pull the 2 popsicle sticks apart and wedge the stack of 7 popsicle sticks between them.

b) SECOND VERSION

Use two rubber bands, secure the plastic to the upper popsicle stick or Hot glue the bottle cap to the other end of the popsicle stick. Place the ball/pom pom etc. onto the spoon/bottle cap.

c) THIRD VERSION

Form a triangle with 3 popsicle sticks and glue the ends together.

Glue one popsicle stick to one of the points of the triangle and glue the other end to where it bisects the opposing side.

Glue the binder clip to the end of the top popsicle stick. I used extra glue around the metal part of the binder clip to make sure it will stay attached to the popsicle stick.

Hot glue the bottle cap to the other end of the popsicle stick.

2. Second workshop: Make balls from different materials and use colors of the country/countries flag, after kids try to throw them different distances, different weights. During this workshop kids study that If you put the same force on two objects of different size, you will get different changes in motion (acceleration).

3. Third workshop: Make different targets (make also an accessory made of elastic for building targets of cups - make competition who will make higher targets of cups without touching cups with their hands). After targets are made, put them in different distances and use balls with different weights to shoot them. It's possible to make competition between groups.

3.5.3. Products and materials needed for manufacturing

Tools		Number of pieces
Popsicle sticks		1 big pack of 6 inch 1 big pack of 4.5 inch
Rubber namds		2 packs
Plastic spoons		10
Marshmallows		1 pack
Small Ball		1 pack
Pom poms		1 pack

Hot glue		1
Binder		10