A few ideas from the ŠOK club

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This paper contains our experience and results from work with pupils at our basic school – ideas for simple tools and experiments andpreviews of projects.

ŠOK

Šok is a Czech word for shock – according to a dictionary it is a reaction of an organism on sudden outer or inner stimulation. For pupils of class 7.C at basic school Brno, Novolíšeňská it is the School Scientific Club (Školní odborný klub). The club is supported by an ESF project granted to the schools.

Main forms of club activities:

- regular weekly meetings (experiments, physics toys, brain teasers, problem tasks, games)
- educational events and competitions (visit to the scientific centre „Palace of Miracles“ in Budapest, Flying Eggs contest)
- interactive and amusing scientific activities for school children and the public

Here are a few ŠOK activities that may be used in education.

1. Recipes for untraditional materials

a) Home made modelling clay

1 litre of water, 30 g of citric acid, 5 soup spoons of oil, 500 g of salt, 750 g of smooth flour, food dye

Mix flour and salt in a bowl. Boil the water and add citric acid, oil and dye, then pour it on the flour with salt and mould the mixture properly. Store the clay in a plastic bag or in a closed vessel.

b) Slime

1st solution: 60 ml of borax, 250 ml of water, food dye

2nd solution: 250 ml of Herkules glue (kind of latex cement), 250 ml of water

Prepare both solutions. The slime is created by mixing both solutions in the ratio 1:3.

Amount for 1 group: Pour into a pot 2 spoons of 1st solution and 6 spoons of 2nd solution and mix properly with a spoon. Next, work the mixture in your hands, let stand for a while and work again. The slime should be stored in plastic bag or closed vessel.

Use in school lessons:

- examination of the properties of matters (specific properties, plasticity, elasticity, interesting behaviour of splitting, ...)
- determining mass, volume, density – school labs

2. Experience with Geomag set

The Geomag set is made in different sizes. The basic parts are magnetic bars and nickel-coated balls.

The set may be obtained for schools with a 30% discount. Children enjoy working with the set and we use it for many creative and construction activities (modelling, mechanics, magnetism, spatial visualizations). The small bar magnets became a part of a set of tools for pairs of 6th class students (topic "Playing with magnets").

From the magnet bars we created **three-dimensional models of magnetic fields of bar magnets:**

Requirements: a jar with a screw lid, 3 small test tubes with caps, 6 magnet bars, iron filings

Make a hole the size of a test tube in the screw lid. Put magnets into the test tubes, plug them and twist a rubber band around the top. Pour the filings into the jar and close it by the prepared lid. Then push the test tubes into the hole in the lid, shake the jar, and observe the formed chains of filings.

Image explanations: otvor – hole, obtočená gumička – rubber band twisted around, zkumavka – test tube, železné piliny – iron filings

3. What is a FYFO?

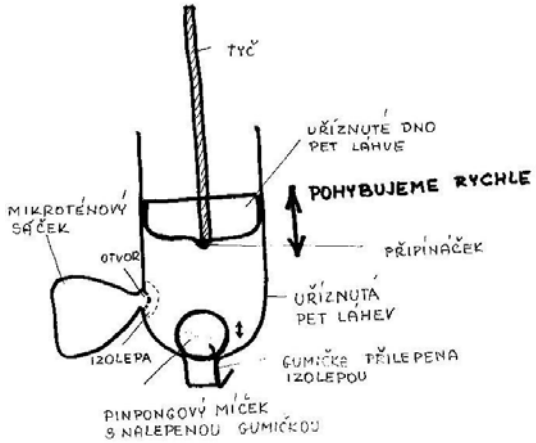
During this time we created with our pupils a database of Physics Photographs (**FY**zikální **FO**tografie in Czech) and discuss the physical problems shown in the photographs. We also use the stored photos in different parts of lessons (explanations, examination, repetition …)

We have had good experiences working with the photographs following this scheme: think up physical question to a given photograph – exchange photographs between groups – answer the question and evaluate it – common discussion about the solutions.

4. Examples of pupil's work

a) Vacuum cleaner **(**aeromechanics, low pressure)

Tools: 2 litre plastic bottle, stick, drawing pin, ping-pong ball, rubber band, plastic bag, cutter knife, scissors, adhesive tape



If we move the piston up, low pressure appears inside the bottle, so the air from outside is sucked through the bottle mouth together with dust and rubbish. After pushing the piston the air pressure rises andthe ball is pressed down to the bottle mouth. The only place where the air can leave now is the hole on the side of the bottle where the bag is glued.

Image explanations: tyč – stick, mikroténový sáček – plastic bag, otvor – hole, izolepa – sticky tape, pingpongový míček s nalepenou gumičkou – ping-pong ball with glued rubber band, gumička přilepena izolepou – rubber band fixed here by sticky tape, uříznutá PET láhev – a cut off plastic bottle, připináček – drawing pin, uříznuté dno lahve – cut off bottle bottom, pohybujeme rychle – move quickly

b) **Archimedes's screw model** (simple machinery, Archimedes's life and work)

Tools: Plastic bottle 2 l, cardboard, wooden stick, sticky tape, drawing pin, stapler, scissors

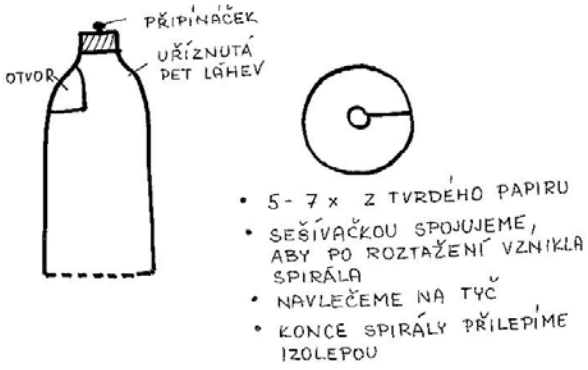
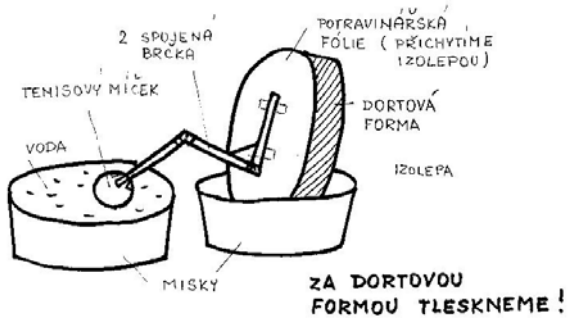


Image explanations: připináček – drawing pin, otvor – hole, uříznutá PET láhev – cut off plastic bottle, z tvrdého papíru – from cardboard, sešívačkou spojujeme … - fix together with a stapler to create a screw after being pulled, navlečeme na tyč – put onto the stick, konce spirály přilepíme izolepou – fix the ends of the screw by sticky tape

The Archimedes's screw is formed by a transversal endless screw inside a pipe or canal. It can be used to transport liquids or powdery materials upwards. The transported material is being held by gravity in cells created by screw threads and it can be moved by turning the screw.

c) **Inner ear model** (acoustics, ear hygiene)

Tools: Cake mould, 2 drinking straws, ping-pong ball, stretch foil, sticky tape, scissors



Sound goes through the auditory canal and invokes tympanic membrane vibrations. These vibrations are amplified by ear bones and transmitted to the cochlea. Inside the liquid-filled cochlea the mechanical energy of the waves is transformed by the organ of Corti into electrical energy of nerve signals. The nerve signals are transmitted to the brain by the auditory nerve.

Image explanations: voda – water, tenisový míček – ping-pong ball, 2 spojená brčka – 2 joined straws, misky – dishes, potravinářská folie – stretch foil, přichytíme izolepou – fix by sticky tape, dortová forma – cake mould, Za dortovou formou tleskneme – Clap behind the cake mould

5. A preview of the project "Nature's patents and inventions"

You can find more about this project at the website www.zsnovolisenska.cz

a) Why is the Prickly Lettuce *(Lactuca Serriola)* called a compass plant?

The leaves of this plant are not placed around the footstalk but they are positioned in one plane aimed in a north – south direction. This is a reaction to Sun movements. The orientation of leaves protect the plant from being overheated in the afternoon hours. This setting also ensures minimum water evaporation during the day.

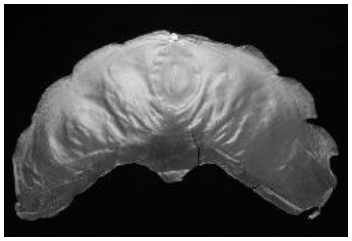
b) Why are aspen-tree leaves shivering even without any wind?

The leaves of aspen-tree have long thin flat leafstalks and therefore they are in an unstable position and react even to the slightest air vibrations. Even in windless weather we can observe updrafts of hot air rising from Earth's surface and downdrafts of cool air falling down to Earth.

c) Why do frogs have long hind legs?

All jumping animals need one pair of strong legs. These jumping legs have to be strong because they produce all the energy required for a jump. They also have to be big enough to carry strong muscles and to work as a lever pushing the animal forward.

d) Why is one of the oldest pieces of the flight history collection at the National Technical Museum in Prague called Zanonia?



Zanonia macrocarpa is a kind of pumpkin growing from Malaysia to New Guinea. Its flying seeds are an ideal example of gliding flight. With favourable conditions they are able to travel even a few kilometres due to their slightly arched shape.

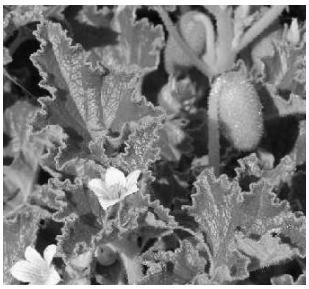
e) Why is the Stalk-eyed fly *(Diopsidae)* interesting?

This fly has its eyes placed on top of long stalks on its head. Such positioning of eyes widens the angle of vision and enables observation of danger from both rear and forward directions.

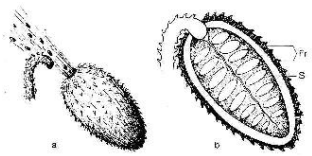
f) Why can't a whale survive aground if has lungs?

The mass of a whale can be up to 90 – 100 tons. In water is its weight compensated by buoyant force. Aground the whale's veins are compressed due to its weight, breathing irregularities occur and the whale dies.

g) Can we find a reaction propulsion in the vegetable kingdom?



The squirting cucumber *(Ecballium elaterium)* is a plant growing in the Mediterranean. When touched, its fruit spits liquid contents with seeds and the fruit itself moves towards the opposite side.



h) What is the skeleton of a rain-worm?

The body of a rain-worm is supported by a hydrostatic skeleton. Such a skeleton is like a bag filled with water – outer layers of a body surround a cavity full of liquid. The water is incompressible which means that if outer layers of the organism press onto the water, the water is pressing back and so supporting the body. The hydrostatic skeleton helps with movement and is very flexible but doesn't offer any protection.

References

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