STEAM Tales

Lesson plans

Ana Mayer Kansky

MIND gGmbH Mittelhessisches Institut für Nachhaltigkeit und Diversität
GoINNO
U.PORTO
cesie the world is only one creature
LogoPsyCom
Co-funded by the European Union

Ana Mayer Kansky's biography

Portrait of Ana Mayer Kansky, Private archive.
Source: 24ur.com (https://www.24ur.com/novice/znanost-in-tehnologija/pred-100-leti-v-sloveniji-podelili-prvi-doktorat-znanosti-prejela-ga-je-zenska.html)

Ana Mayer Kansky was born in 1895 in Lože pri Vipavi, in Slovenia. She and her family lived in a castle that her father inherited. She studied chemistry and physics in Vienna. She had to leave the university after the end of the 1st WW and continued studying in Ljubljana, where she was the first person ever to achieve a PhD. She was one of the first research assistants and published a few scientific papers. Due to unknown reasons, she did not continue her academic career but started her entrepreneurial career in chemistry. She was the head of the laboratory. She and her husband established a chemical factory, which laid the foundations for today's important chemical and pharmaceutical industry in Slovenia.

She died in 1962 when she was 67. Since 2023, the award for the most outstanding doctoral work at the University of Ljubljana is named after her.

Co-funded by the European Union

STEAM Tales

Lesson plan 1

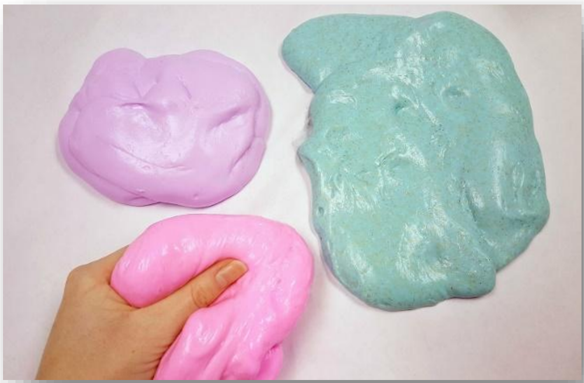
Making slime Keywords: home chemistry, measurement, laboratory equipment	
Duration: 55 min	**Age:** from 6 to 9 years old
Place: Classroom	**Related STEAM areas:** **S** (Science): Children practice precisely measuring different ingredients and learn how to use simple laboratory equipment. **A** (Art): Children can play with slime.
Description	During this experiment, children will make their own slime to play with by closely following instructions and precisely measuring ingredients. They will mimic laboratory work and end up with something that they did and could play with (slime).
Learning objectives	At the end of this experiment, children will be able to: • Identify some of the laboratory equipment; • Exercise their precision; • Exercise following instructions; • Be able to see the usefulness of chemistry;

	• Practice (fine) motor skills and precision.
Connection to the female role model	Ana Mayer Kansky was a chemist. After quitting her job at a university, she opened a chemical factory (together with her husband) and a store where she sold different chemical products. Her knowledge of chemistry together with her inventiveness has enabled her to create many things with simple, easy-to-find ingredients. In this experiment, children will do the same.
Individual or group	Group.
Safety	After every use of the slime, wash your hands with the soap!
Materials	☐ 250 ml glass ☐ 150 ml of warm water in a glass ☐ A spoon ☐ A kitchen scale ☐ 3 weighing vessels (e.g. small dipping bowls or small yoghurt cups) ☐ Wooden sticks (e.g. ice cream wooden sticks) ☐ A syringe ☐ A small plastic cup (with a 5 cm radius) ☐ Borax powder (approx. 10 g) ☐ Pattex glue (or any liquid clear or white glue)

	☐ Shaving cream ☐ Food colouring (different colours) ☐ A sponge ☐ Plastic foil ☐ Scissors ☐ A soap ☐ Paper towels
Lesson plan	
Introduction (10 min)	Do you know what slime is? Do you like playing with it? Have you ever wondered how it is made? Well, today is your lucky day because we will be making slime from simple ingredients that you can probably find in every home. Our classroom will be transformed into a laboratory and we will all become scientists who work in a laboratory. But do you know what scientists need to be particularly careful about while making experiments? They have to be very precise in measuring ingredients if they want the experiment to work. So, if we want to create a slime that we can actually play with, we have to pay special attention when following instructions.

	If you read the story before the experiment: During her study, Ana gained extensive knowledge of chemistry. She decided that she should put that knowledge to use. Together with her husband, she opened one of the first chemical factories in Yugoslavia and managed a company named after her. Amongst other things, she sold chemical products that were made from domestic raw materials. If she were alive today, maybe she would also sell homemade slime!
Research question/hypothesis (5 min)	Here is our research question: Do you think we will be able to make our own slime that we could play with? Children should be encouraged to give their answers, even the wrong ones. All opinions should be included and not discarded right away, even though the teacher knows they are not right. The experiment will serve to answer the research question, mimicking the scientific method.
Step-by-step instructions (30 min)	**Step 1**: Measure 5 g of borax on a weighing vessel with a kitchen scale. **Step 2**: Measure 20 g of glue on a weighing vessel with a kitchen scale.

	Step 3: Measure 4 g of shaving cream on a weighing vessel with a kitchen scale. **Step 4**: Add 5 g of borax to 150 ml of warm water and stir well with a spoon in a glass. Set aside. **Step 5**: Put 20 g of glue into 250 ml glass. **Step 6**: Choose a food colouring of your liking and add 1 drop to the 250 ml glass. **Step 7**: Add 4 g of shaving cream into a 250 ml glass and mix everything together with a wooden stick. **Step 8**: Stir the borax mixture from the 4th step. Measure 3 ml of borax mixture with a syringe. **Step 9**: Add 3 ml of borax mixture to the mixture in 250 ml glass. Mix it well. **Step 10**: Add another 3 ml of borax mixture to the mixture and mix it until it becomes a lump. **Step 11**: Add another 4 ml of borax mixture; if the mixture is still too sticky, add another 1ml of borax mixture. On the other hand, adding too much of the borax mixture makes the slime too thick. So be careful and observant when adding ingredients. **Step 12**: Take the lump in your hand and play with it; the more you crumple, the less sticky it becomes.

	After the activity, you can put slime in a plastic cup and cover it with foil. The end result following the above steps should look like this: 
Source	In this video you can follow a similar process but with slightly different ingredients: "HOW TO MAKE SLIME For Beginners! NO FAIL Easy DIY Slime Recipe!" by Gillian Bower Slime
Conclusion (5 min)	We can now answer our research question: We were able to make slime that we could play with! Because we carefully followed the instructions and paid attention to the correct quantities of ingredients, we got the desired result – our own slime!
Explain the experiment (5 min)	The success of our experiment depended on following instructions and exact measures. If scientists want to repeat a particular experiment, they have to do the same. This is especially important with laboratory

	work. Just one incorrectly measured component can cause an experiment to fail. If we made a mistake with our experiment, it would only mean that we wouldn't be able to play with slime but image you are making, for instance, medicine and you make a dosing mistake – the consequences could be very serious.
The science behind	The viscous mass that we call slime and is the final result of this experiment is made after a chemical reaction between **polyvinyl alcohol and borate ion,** which creates **polymers**. This chemical reaction is called an endothermic reaction. The **glue** that we used in the experiment has an ingredient called **polyvinyl acetate**, which is a liquid polymer. The **borax** that we also used in the experiment has a **borate ion**. Borax links the polyvinyl acetate molecules to each other, creating one large, **flexible polymer**. Slime is a fluid but not a regular one; because it changes viscosity it falls under category that scientists call **non-Newtonian fluids**. This means that slime changes viscosity from low (when it flows like a thick liquid) to high (when we squeeze it and it feels like a solid).

Lesson plan 2

Solving dried markers Keywords: solvents, useful chemistry, recycling, reusing	
Duration: 50 min	**Age:** from 6 to 9 years old
Place: Classroom	**Related STEAM areas:** **S** (Science): Children will learn about solvents and be introduced to the process of dissolving.
Description	Children will recycle their markers and make them work again. During this experiment, they will compare two different solvents – alcohol and water and find out which works best for renewing the markers.
Learning objectives	At the end of this experiment, children will be able to: • Explain what solvents are in their own words; • Understand the properties and uses if solvents • Understand the basics of dissolution; • See the usefulness of chemistry; • Practice (fine) motor skills and precision.
Connection to the female role model	Ana Mayer-Kansky was a chemist. After quitting her job at a university, she opened a chemical factory

	(together with her husband) and a store where she sold different chemical products. Her knowledge of chemistry together with her inventiveness has enabled her to create many things with simple, easy-to-find ingredients. In this experiment children will be able to see how useful chemistry can be and what we can do with easy-to-find ingredients at home.
Individual or group	Individual or in pairs.
Safety	The knife should only be used by adults.
Materials	☐ A bottle of 99% ethanol or isopropanol (for the whole group) ☐ At least two plastic cups ☐ A plastic cup of water ☐ Dried markers (at least one for each child) ☐ A sheet of paper (one for each child) ☐ At least 2 high glasses ☐ Pliers (to be used by adults) ☐ A syringe (if possible for each child/pair) ☐ Paper towels ☐ Protective goggles (optional)
Lesson plan	
Introduction (10 min)	Imagine you are at home and you want to draw an animal you saw on TV. You find a piece of paper, take

	out your markers, pick your favourite one and start to draw. But what is this? Your favourite marker is not working properly? What now, what do you do with it? Ask your parents to buy you a new one and throw away the old one? What if I told you there is another solution to your problem that includes you transforming into a scientist? During this experiment, we will try to bring old markers back to life with a little help from chemistry! **If you read the story before the experiment:** During her study, Ana gained extensive knowledge of chemistry. She decided that she should put that knowledge to use. Together with her husband, she opened one of the first chemical factories in Yugoslavia and managed a company named after her. She sold chemical products (mostly esters and solvents) that were made from domestic raw materials. Today, we will see how useful chemistry can be as we will try to save markers with easy-to-find, domestic ingredients.

Research question/hypothesis (5 min)	Here is our research question: Do you think we will be successful in making old markers work again? Which liquid do you think will work better, water or alcohol? Children should be encouraged to give their answers, even the wrong ones. All opinions should be included and not discarded right away even though the teacher knows they are not right. The experiment will serve to answer the research question, mimicking the scientific method.
Step-by-step instructions (25 min)	**Step 1**: Let the children test all the markers and put all the non-writing ones in one pile. **Step 2**: The teacher should remove the cap from the back of the dried markers; he/she might need to use pliers to do so. **Step 3**: Each child rolls out paper towels on the table before him/her (to prevent a mess if something spills or dye from the markers flows). **Step 4**: Each child should have a white sheet of paper on his/her desk. **Step 5**: Mark the plastic cups. On the first, write a symbol for water (a droplet), and on the other, a

	symbol for alcohol (a crossed droplet). Use the same symbols to mark the 2 high glasses. **Step 6**: Pour some water into the first cup with a droplet. **Step 7**: Pour a little alcohol into a second cup with crossed droplet. **Step 8**: Use a small syringe to add a few drops of alcohol into a pen. Hold the marker vertically when doing this so the cap of the marker is at the bottom. **Step 9**: Place the marker vertically in the tall glass with the crossed droplet symbol (with the cap at the bottom) so that the alcohol can flow downwards and dissolve the dye. Let the markers rest in this position for a few minutes. **Step 10**: Use a small syringe to add a few drops of water into a pen. Hold the marker vertically when doing this so the cap of the marker is below. **Step 11**: Place the marker in the high glass marked with the symbol of the droplet vertically. Wait a few minutes. **Step 12**: When all markers are filled with alcohol or water and have rested for a few minutes, test them on

	paper. Observe the differences between those, filled with water, and those with alcohol. **Step 13**: If any of those with alcohol do not write, add a little more using a syringe. **Step 14**: When those filled with water are dried, you can fill them with alcohol. **Step 15**: When all markers are writing, attach the caps back on.
Source	One example of a video that offers the same solution but without the water part. Another difference is that in the video, the tip of a marker is removed. "Reviving Dry Alcohol Markers" by Muse Kits
Conclusion (5 min)	We can now answer our research question: The answer to our first question is yes, we were able to make the markers work again! We could see that alcohol does a much better job at dissolving the dye in the markers compared to water. Therefore, the answer to the second question is – alcohol.
Explain the experiment (5 min)	Markers that were filled with water released some colour but only worked for a short period. Markers that were filled with alcohol worked much better; the colour of the marker was clear and as good as new.

	Alcohol was able to dissolve the dye and renew the markers.
The science behind	**Solvents** are substances (usually in liquid form) which are capable of **dissolving** other substances, creating a **solution**. We know organic and inorganic solvents. **Organic** solvents are carbon-based, which means they contain carbon in their structure. Some examples of organic solvents are: alcohol, esters, and ethers. Whereas **inorganic solvents** are solvents that do not contain carbon. The most common one is water (containing only hydrogen and oxygen). Some others are: ammonia, sulfuric acid, and fluoride sulfuryl. Inorganic solvents are known for being good electrical conductors. In their attempt to make markers work better, children often soak the marker in water, which is a short-lasting solution, and they write worse after some time because water is not a solvent in this case. If soaked in/filled with water markers write, but the dye quickly dries out. This means that the alcohol has evaporated out of the marker, and there is undissolved, dried-up dye left in the marker.

	Markers need organic solvents to dissolve the dye in them allowing the dye to flow. In case of this experiment, alcohol serves as an organic solvent.

#steamtales–project

www.steamtales.eu

Co-funded by
the European Union

All content is under CC BY-NC-SA 4.0

STEAM Tales (KA220-HE-23-24-161399) is funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the Nationalen Agentur im Pädagogischen Austauschdienst. Neither the European Union nor the granting authority can be held responsible for this.

MIND gGmbH Mittelhessisches Institut für Nachhaltigkeit und Diversität

GoINNO

U.PORTO

cesie the world is only one creature

LogoPsyCom