

Hello my name is Velika Markova and I'm chemistry teacher in primary school "Strasho Pindjur", North Macedonia. And my name is Gjorgjina Dimova and I teach informatics in the same school. We are going to present to you our project "Clean home = good health or NOT?" where we use integrated STEAM approach for solving real life issues.

The integrated subjects are: chemistry, informatics, mathematics and art.

We started with some real life questions for the students. How classical cleaning products that we use every day influence our health? Can we use everyday materials we have at home to make organic cleaning product? How can we interpret data collected from a research and make conclusion? How IT tools can be used in designing process?

The goals for the lesson arise from the standards from the different subjects Raise awareness about using safe cleaning products at home. Distinguishes between acid, bases and neutral solutions using indicators and pH scale. Present a chemical reaction of carbonate with acid. Makes statistical interpretation of data from a research. Calculates using formulas in Excel and creates chart. Design package and label for a product.

Now we are going to present to you all the activities done during this project. We started with the discussion with our students about the cleaning products we use at home, how does it feel to clean with this product, do they irritate our eyes nose and throat and do we know the content of the cleaning products.

As first activity the students the toxicity, corrosiveness and pH value of one cleaning product they have at home. The activity was done online because during that time we were on distant learning. As a conclusion the students realized that all the cleaning products are very toxic, most of them are strong acids or strong base and they are very corrosive.

As second activity we made a discussion and research how we can make cleaning product that won't hurt our health and that is made from materials we all have at home. At the end the students decided to make cleaning product by using vinegar and orange peels. Orange peels contain limonene which is strong degreaser. So we asked the question do we have enough material to make the cleaning product?

So students made a research on how much organic waste are generated in a family during one week. During math classes they made a research plan and instruments for data collected. They measured all their organic waste during one week, they filled a table and by using Excel they made a summary table of the results, by using formulas they calculated the average value and they created a column chart to visualize the data.

The fourth activity was actually the production of the cleaning product. They filled a jar with orange peels and alcoholic vinegar. So that mixture was set to standing for two weeks with occasional shake of the jar. After two weeks the mixture was filtered and then we added a dishwashing detergent.

The fifth activity was creating a web and video instructions as a way to disseminate all our findings and all our activities so other students and other schools can do the same.

As the sixth activity we measured the pH value, the corrosivity and the efficiency of the new cleaning product. We found out that the product has a pleasant smell, and does not irritate the eyes, nose and the lungs. Its pH value is 5 and its not corrosive.

We also checked what will happen if we add baking soda. The soda will strengthen the effect of the cleaning product and will make it more efficient.

Using app geysers it is an online software for creating mobile applications so we developed a quiz with the questions that arose from the activity so far. The quiz can be used during chemistry classes.

During art classes students created a logo, label and designed the package for the cleaning product. We made also a prototype that we printed on a 3D printer. In the future we are planning to use these packages for the cleaning product.

This kind of approach needs different organization in the school. Teachers should be able to cooperate and prepare lessons together. The class schedule should be organized in a way that all subjects can be integrated. It takes more time from teachers but it's more rewarding because the knowledge and skills the students are gaining are lifelong.