

Personal Chemistry Topic: Lisa Morine

Teacher's Guide

Goals

- To research a personal chemistry topic, in which all steps, from design to synthesis of molecules, are followed
- To start out from students' points of interest in order to make learning more effective

The Personal Chemistry Topic

In the personal chemistry topic, the students are asked to choose some subject about the chemistry of the human body, for example, the chemical structure and synthesis of different medications. The students start from their own interest and go on to learn chemistry, enjoying both.

Lecture Notes

You have got to pick a personal topic related to chemistry.

You need to have a presentation ready. It has to have a visual. You may have slides or pictures, you may have filmed something, and you might have done a puppet show or a rap.

It is up to you how you want to do your project.

Are you ready to do some research on the Internet? I pulled out a whole card of books and encyclopedias from the chemistry section.

Instructions

Research—this includes:

- Introduction to the substance research
- Three paragraphs of facts
- Your feelings about what you learned
- Concluding paragraph

Presentation—this includes:

- 5-10 minutes in length
- A visual component

Lesson plan—this includes:

- Learning objectives
- Lesson procedure
- Any materials needed

Experiment—this includes:

- Getting prepared for the experiment
- Showing what you did in class work

Teaching Tips From Ms. Morine

This exercise is an individual project in which the students are given tasks. The first task is to write a research paper about a chemical, and the chemical is a personal chemistry topic. Personal chemistry is the chemistry that deals with the human body. There is a very broad range of topics, for example, illegal drugs, cosmetics, cleansers. Anything that goes in their body can be a personal chemistry topic.

They get to pick the topic, they do a research paper on it. The second part is a presentation/lesson. They present the information they learned. That way it is not one person learning only one subject, but they share what they learned with everybody.

What I like about online research or an independent research project is that, it is very open-ended to what the students' interests are. For example, if they are interested in lipstick, drugs, or medication. For example, one student has asthma, so she is taking medication, and she's doing the personal project about her medication.

Whatever their interest is, then they can focus on that, they can learn from it, they can do a lot online, and because the interest is high, they learn a lot of chemistry that way. Any student-directed activity can help them learn chemistry better, I think.

I might give them five minutes totally free to find out, to see what it's like. And what happens is frustration, because there's so much out there, and they find out that it is much more difficult than they had anticipated. They get the five minutes of frustration, then I'm there to narrow it down.

I teach them two skills: chemistry skills and research skills.

Example for Personal Topic: Making Aspirin

Teacher's Notes

You can demonstrate making aspirin and I have information for you on how to do so.

Comment

See for example:

Olmsted, J. A., III. (1998) "Synthesis of Aspirin: A General Chemistry Experiment," *Journal of Chemical Education*, Vol. 75, No. 10, pp:1261-1263.

Pandita, S., Goyal, S. (1998) "An Efficient Microscale Procedure for the Synthesis of Aspirin," *Journal of Chemical Education*, Vol. 75, No. 6 p: 770.

You probably have to come here one day after school so we can practice.

You might even want to do the demo on video first, because you will be using concentrated nitric acid so we want to be careful.

Search the Internet using the keywords aspirin synthesis or go to:

<http://www.chemheritage.org/EducationalServices/pharm/tg/asp/asp31.htm>
A complete lab activity for making aspirin, including student and teacher guides.

Here is aspirin, right there: it has carbons, hydrogens, and oxygens. That's all it has. You will start out with salicylic acid, which is a white powder, add different chemicals to it, and get aspirin.

Salicylic acid—it comes from the bark of trees. They use phosphoric acid, but I will have you use nitric acid. Any acid can make it do this.

SAFETY

Use safety goggles at all times. Wear aprons and gloves. Open and use all strong acids and organic materials only in the fume hood!

Laboratory Discussion

The next chemical [nitric acid] is very dangerous and you really have to use it in the hood. These are truly unsafe chemicals and you need to order such chemicals through a company. You need proper storage and usage and you should use them in a fume hood. So there's no way you could find them around the house. You can buy aspirin over the counter but chemicals used to prepare aspirin you can only buy from a chemical company.

After we take it out and add distilled water, and we put it on ice, will it freeze? No, it will not. It will cool down to make crystals.

It's like making rock candy from sugar: first you have to heat the sugar and dissolve it. Then you let it cool down.

You made aspirin from salicylic acid, so you let it crystallize, to acylsalicylic acid. Acylsalicylic acid has another double-bond oxygen, a set of three hydrogens and a whole other carbon. So acylsalicylic acid has this extra carbon double-bond oxygen, carbon tri-hydrogen, it's almost an Acetate so they call it acyl.

Why will it not be good to try your aspirin now? Because it's not made in the factory, and you don't know how pure it is. In the factory they have quality control and its done on a commercial level. But, it is still aspirin that comes out.

Concluding Remarks—Ms. Morine

I think that they are doing really well. I'm so impressed with how thorough they are and how they read the directions and followed them, they had questions, they weren't afraid to ask. So, I'm very impressed.

I am glad they did it, because I think it helps the students that don't get the opportunity to use chemicals like this, to feel the dangers, and they learn to see how it appears.

In the past, all students used to make aspirin, but now there are safety regulations against it, so at least they got to see how you actually design a chemical.

One wonderful thing that I found on the Internet was a bunch of rubrics from the Harvard Division of Education: http://artsedge.kennedy-center.org/professional_resources/howto/rubrics.html.

They had all kinds of rubrics regarding PP presentations and rubrics for oral presentation. I kind of modified it for this project, there's a lot of cut and paste in it, but it's a rubric and it's made grading easy and fair. I have done it so many times now, that it's all in my head so as they are presenting, in my head I am clicking: yes, they had good projection, yes, they were clear on their topic, yes, they had faced the audience. Then I can grade it in my head and give them their grade right away.

Concluding Remarks—The Students

Aspirin is a drug. Some people think that it's a safe drug. But when you think about it, there's a lot of dangers that it poses: if you don't know how to take it, when to take it, what to take it for. That's why we decided to pursue aspirin. I mean, I learned a lot. I didn't know before. Sometimes I had a head ache, and I used to take about three or four aspirins, it's not really good.

To me, I was very nervous [about the presentation].

The video really helped me. I watched the video once before and I knew where I was going to fast forward and where to go slowly. I had the lab report in my hand and I actually knew the stuff, I knew what I was talking about: why I used phosphoric acid, and distilled water, and that really helped.

I think that it really helped me doing this project.