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CEP 816

Instructional Dream

In a culture of education that is constantly geared towards teaching to the test it is important to remember that we must teach students how to use the information they learn in the classroom in the real world. There are science classrooms made for those who are not going to be scientists in the traditional sense, but who will use some form of science in their everyday life. I would like to go beyond the textbooks shallow attempt at real world situations and insert in hands-on activities, interactions with experts, and other real world applications. This portion can take place in small chunks throughout the unit, before the unit, or as an inquiry lesson to start off the unit.

My unit is meant for a low level chemistry course. This particular low level chemistry course is comprised of 18 students each needing their own form of special attention. Around half of the students have either IEP's or 504 plans, and the other half have ESL accommodations. There is a sprinkling of students who have taken the course as a science elective, and do not fit either of the breakdowns above. In the creation of this course it was meant for those students who truly struggle learning chemistry in the construct of the everyday classroom, and who need more hands-on learning than is found in the regular chemistry course. We make use of the text *Active Chemistry* (Arthur Eisenkraft, 2007) and it acts as a lab book in itself. All lab activities are based on this textbook, but all extension research activities are based on my addition. On average we do two labs per week whereas the regular chemistry course only does one (if that). These students work with units that have "real world connection", but I feel as if more could really be done to enhance their learning by having them truly connect with members of their

community. The members of the community that I would like for them to make connections with are not chemists, but they work in fields that requires them to make use of the chemistry they learned along the way. These students will be successful someday, and I would like for them to see how the material in this classroom will be relevant as they go along in their everyday life.

The unit the students will be working on is Art and Chemistry. They will be discovering how important chemistry is to the creation and preservation of art. In the process of learning how different types of art and art materials, are created they will learn about all the different ways chemistry is used in art. They will learn about pH, acids/bases, bonding, alloys, malleability, and so on. The culminating activity in this unit will be the classroom creation of a museum where each student will create a piece of art to put into it. They will have to be able to talk about the chemistry that went into the creation, and the preservation, of the artwork.

Students will not have to be great artists to complete this challenge as they will be graded on the effort they put into the image of the work, not in whether it could be put in a real museum or not.

Students will start out the unit by working in the computer lab creating a PowerPoint that will answer two questions “What is art? How does chemistry play a part in art?” I will leave the question as open ended as possible, but will be willing to provide direction where necessary.

They will receive two days in the computer lab to create this PowerPoint. The first day they will have to do their research, and the second day will be used to create their PowerPoint. On the day of research I will require that they spend the entire hour expanding their search, and that they will have to document their research. In the process of researching they will have to come up with a collection of definitions, types of art, materials, and how science is related to art. Like we did with the “Justice” discussion my goals are such that I am hoping that students will go

beyond their initial thoughts of art, and dig deeper into what art is as a scientific construct and what art is as a social construct. They will then present their findings to the class, and as a class they will work to constructively criticize each other's findings. This will lead us into the discussion of the unit's project of creating a museum and a piece of art to go in that museum.

The unit will be broken into eight activities each of which will teach students, in a hands-on manner, about the chemical properties behind art. The first activity is researching what makes something art. In the second activity students will learn about acids, pH and how different materials are affected by exposure to acids. In this second activity students will learn about how to identify the pH of a substance by using universal indicator. They will then look at the effect of acid rain on water supply, and artwork. They will finish off this activity by creating their own lab in order to test which materials are best suited to handle being placed outside.

After this activity I would bring in a builder (any type will do) from the community to speak with my class about how he must consider the environment the piece will be placed in before building it. The students will ask questions in relation to how he must make use of chemistry every day. If he could not come into the classroom I would see if he would be able to do an interview via an online chat forum, like Skype, with the class. This would allow for the class to still be able to speak with a member of the community, and find out how chemistry can be used in jobs that are not done in a chemistry lab.

The students would be required to prepare questions before the presentation, and have them submitted to me for approval or rewording. On the spot questions could be asked if written down and approved by me before asking. I would have to make sure to have a meeting with the presenter before being interviewed by the students about the type of student in the classroom. It

is important that he keeps the students informed in how he uses the chemistry without getting too crazy with all the details as the students instantly lose focus when they become lost.

In the third activity students will learn about the chemical behavior of metals. They will be testing different metals to determine their relative reactivity. They will then explore the concept of valence electrons, and then end up with trying out the process of electroplating. In this activity they will learn many important concepts in relationship to the atomic structure of metals. They will get the hands-on ability to see which metals produce the best electrical conductivity and also get to turn a nickel strip into a copper plated strip. This will then lead into conversations about how could this process be useful to artists? This will then lead us into a discussion on how sculptors and jewelers make extensive use of this process. The students will then be required to interview a jeweler, or jewelry salesman, about their use of electroplating in their collection. They will be sent with a list of possible questions to ask, but will be free to expand upon those questions. They will be given a week to complete this task, but as there are jewelry stores on every corner in our area there should be no shortage of people to interview. They will then get a real life introduction to those who work with electroplating, or electroplated objects, in their everyday experiences.

The fourth activity will be working with the physical behaviors of metals. They will be working with alloys, and noticing how the behavior of the specific metals used to make the alloy are affected with heating/cooling. They will start off the activity by making brass out of a penny by melting down the covering of a penny to where it mixes with the zinc interior creating an alloy. They will then work with the properties of steel as it is continuously heated/cooled. They will learn about the terms annealing, hardening, and tempering. I have multiple students who work with metal on an everyday basis (creating jewelry and other objects) and they will provide

a great insight into the working of metals. This will lead into a discussion on the use of metals for art, tools, and everyday objects. I will then have my students who work with metal outside of the classroom talk with the classroom about what they do. The students love to hear from their own peers, and this will be a great opportunity for them to speak about their skills. The students will get the chance to ask their classmates questions, and to see some of the work that they have done.

In the fifth activity they will work with clay and learn about how the hydrating/dehydrating process occurs. They will heat a hydrated piece of clay and observe the changes in the clay as the water is removed. This lesson will end by having an artist from the community who specializes in pottery come into the classroom to discuss what he does with the students. If the potter cannot make it into the classroom then we can interact through a chat forum. As with the builder the students will have to prepare questions, and have them pre-approved. I will ask the potter to discuss the process that they use to create their works of art, and how they have to account for the chemistry within the process. They can also discuss with the students how students can get into doing pottery on their own, and what they need to know to be able to do that.

In the sixth activity the students will work with the chemistry involved in making paints. They will create solutions and in the process will learn about precipitates. They will then use their new knowledge on insoluble materials in order to create paint pigments. Once they have created the required paint colors they will then be allowed to explore in order to create different types of paint pigments. They will then use these pigments to create a mini piece of art. This mini piece of art cannot be the piece that they will put in their classroom museum but they can use it to help themselves plan for their piece. These quick paintings will then be posted around the

classroom the next day. The students will spend a day in the computer lab researching how precipitates play a part in various types of arts: photography, paint, copper patina, and discoloration of statues over time. This research then can be used to help them in their ventures of creating a piece of art for their project. The majority of students will create art based on a painting or drawing, and so it is important that they understand the process of creating pigments used in paints.

The seventh activity will be about what makes dyes. The students will work with extracting natural dyes and creating artificial dyes. They will learn what affects the color and colorfastness of dyes. They will look at two natural dyes, and after toying with the pH level will make conclusions about the relationship of pH to dyes. They will then test how the addition of metallic salts can increase the ability of dyes to hold to material for longer. They will then be challenged with creating natural dyes in order to make tie-dye shirts. They will have to describe what they used to create the specific colors and why they chose the ones they did. The students will then spend a day in the computer lab researching the history of dyes. They will create a timeline of the use of dyes from early history to today. They will compare/contrast the use of natural dyes to synthetic dyes. They will also research the best way to preserve colors. Students will see the ease with which you can create dyes in order to use in their project if they choose. They will also then be able to talk about the chemistry behind the use of these dyes, and how to preserve them.

The last and final activity will be working with the properties of stained glass and glazes. Students will be creating glass beads of different colors out of borax and different metallic compounds. Because the temperature needed to melt glass is higher than can safely be produced within a classroom we will be making borax “glass” instead. They will be able to see how

different color beads are created through the use of different metallic compounds. They will also then use the same properties to create glazes which will take pottery from basic to beautiful. Some students will find that they would like to create something to do with glass for their piece of art, and they will be able to talk about the chemistry behind it. This is then something the students could do under classroom supervision for their project. Students will then spend a day in the computer lab researching two different topics. The students will all research to find several recipes for glazes. They will have to list all of the ingredients be careful to pay close attention to the compounds that are used to create the colors. They will then finish their research by talking about how glazes are applied/used by potters.

All of the research that they are doing will be kept within their binder and will be used to help them create their final project. It will also help them to evaluate the work that others have done too. They will be able to effectively create a pamphlet describing their piece and the chemistry involved in it. The students will then have to write a proposal of the piece they would like to create including: description of piece, type of art, materials/resources needed, time required to create piece, chemistry behind the piece, chemistry behind the preservation of the piece. They will have a day in the computer lab to research more information into their piece if necessary. They will then receive two days in the classroom to work on their piece. The piece will be due a week later.

Before their piece is due the student will be taking a field trip to visit a local museum to talk with a curator about the art. They will see how the art is kept and the different environments needed for each piece. They will get to also speak with the curator in how the artwork of the different times were created, and see how the artwork has changed over time. This trip will also give the students ideas that they can use for the types of art they would like to produce.

The final day of the projects they students will set up the room like a museum where their pieces will stand alone with only the help of their pamphlet to describe what it is. The students will be able to see how the chemistry they have learned throughout the semester was put to real-world use. All of the different activities, and results of those activities, was put to use to create something beautiful and unique. In the end the students have learned the chemistry put forth to them, but they were also able to take their knowledge and put real-world use to it. Some of these students could be then inspired to create art down the road for a living. Even if they do not create art they will be able to use these concepts in all different types of work settings.

Bibliography

Arthur Eisenkraft, P. (2007). *Active Chemistry*. It's About Time, Herff Jones Education Division.