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Chemical-Calculation Relationship: Active Methodology For Learning. A Case Study

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ABSTRACT

This article introduce one of the events that took place in a chemistry class given to first semester students in the area of civil engineering , physics , mechatronics and renewable energies . During the exposition "states of matter", the student made an experiment called "Alcohol clouds"; at this moment, another student asks how this experiment is related to calculus: the student who makes the question shows the work what relates chemistry and calculus. It remarks the importance of relating the areas of knowledge, encouraging and persuading the participation of the students to not only understand the relation of science, but also to see how useful the subjects they're studying are. The motivational factor is essential in a college student.

Keywords: Scientific Education, Chemistry, Cloud of alcohol.

Contextualization

The importance of the Scientific Education and of Chemistry in the formation of the citizens is a reality demanded by the society of the information and the knowledge of the XXI century. Now, more than ever, teaching with a critical spirit the Experimental Sciences are an essential part of the knowledge of our time. The challenge facing the design of chemistry subjects in engineering studies is to ensure that all students feel motivated. To overcome this challenge, it is necessary to design strategies that address this problem and that start from the knowledge of the academic background of students and the monitoring of the subject throughout the first year of their university studies. The objective of the subject is to establish the relationship that Chemistry has with these four Engineering, from different fields but highlighting the materials used in these university careers. It is a semester subject with a teaching load of four hours / week and compulsory.

Methodology Developed

In this article the development of a session is presented, of the subject "states of aggregation of matter", in the frame of the subject "Chemistry" of the first course of the following Engineering: Civil, Physics, Mechatronics and Renewable Energies.

The dynamics consisted in the exhibition of this theme by the young **Joseph Andrei Colmenares Rodriguez**, some of the moments of the exhibition are shown in images 1, 2 and 3.

Image 1: The Student Colmenares performing the experiment

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Image 2: Student Castillo participates in the experiment

Image 3: Students get the alcohol cloud

The young Colmenares developed the theme starting with the experiment "Cloud of alcohol", the description of this experiment is as follows:

The cloud can be formed with both substances (water and alcohol) will form a cloud, due to the pressure exerted by the air that is being pumped into the bottle, but, alcohol, due to its composition (hydrogen, carbon and hydroxyl), forms a larger and faster cloud. The composition of the clouds is of water with separated particles, with a great pressure, due to the altitude in which they are, Is it possible to create a cloud by applying pressure to the water? And if another substance is used, will the cloud be larger?

Development

1. Drill a 3/8 inch (9 mm) hole through the rubber stopper. Lubricate the valve stem with a small amount of petroleum jelly and push the valve stem through the narrow end of the plug. Connect a bicycle air pump to the valve stem protruding from the wide end of the plug.
2. Pour approximately 2 ounces (56 g) of alcohol into an empty 2-liter bottle. Tilt the 2-liter bottle on one side and rotate it so that the alcohol covers the entire interior of the bottle.
3. Insert the rubber stopper into the opening of the bottle and press firmly to form an airtight seal.
4. Hold the rubber stopper in place with one hand and pump the bicycle pump three or four times with the other hand.
5. Create a cloud in the bottle by removing the cap from the opening of the bottle.

The reason that alcohol forms a more visible cloud is because alcohol evaporates faster than water. Alcohol molecules have weaker bonds than water molecules, since more alcohol molecules are evaporated in the bottle, there are also more molecules capable of condensing. That's why you can see the alcohol cloud more clearly than the water cloud.

Intervention To Relate Chemistry With Calculation

During the exhibition of the young Colmenares, the young Ernesto Jesus Castillo Várguez asks: how would you explain the issue with calculation ?, Colmenares replied: at this time I could not answer but if you want we can do it and discuss it

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tomorrow, what do you think? He said: Yes, I will explain. The next day the young Castillo gave me the following work:

Mathematical analysis of the "Cloud of Alcohol" experiment

The experiment consisted of creating a cloud inside a bottle, this was done by placing alcohol in the bottle, shaking it a little so that it becomes a part gas, and then with a bicycle pump to inflate it, increasing the pressure. When the stopper is removed, the alcohol cloud forms.

To explain why this happens, I will use the ideal gas equation.

$P\,V=nRT$

P: Pressure n: number of moles T: Absolute temperature (kelvin)

V: Volume R: Constant of ideal gases

Then, we will analyze two instants, one before the stopper is released, and one immediately after the stopper is released.

Before

The body has an initial pressure P_o, an initial volume V_o, and an initial temperature T_o, and a certain amount of moles n.

After

The body will have a final pressure P_f equal to the atmospheric pressure, which will be lower than the initial pressure, a final volume slightly smaller than before the plug is released, but for practical purposes I will assume that it remains constant, and as I analyze a moment after the plug is removed, I can consider that not a single particle of gas escapes, therefore the Amount of moles n_2 it will be the same.

Then the equations remain:

Before:

$P_o\,V_o = n_1\,R\,T_o$

After:

$P_f\,V_f = n_1\,R\,T_f$

But

$V_0 = V_f$

$n_1 = n_2$

Therefore I can equate the equations as follows:

$$\frac{P_o}{T_o} = \frac{P_f}{T_f};$$

I know that $P_o > P_f$, Thus $T_f < T_o$ so that equality can be maintained.

This result makes sense, since it tells us that when we remove the plug the temperature inside the container will be lower than the one at the beginning, which will cause a certain amount of alcohol in a gaseous state to condense and form a cloud. In everyday life, the clouds we see form in a similar way.

Analysis Of The Event Occurred During The Class

It is at that point that I would like to highlight as "no one knows more than all of us together", since this is the true spirit of teaching, of learning, of the exchange of experiences in a classroom: all contribute, all ask, all collaborate, at the end of each session, when we conclude what we have learned, we describe the events that occurred, once again, we can emphasize that always in a group of students, the ways of observing, and literally learning the theme developed it has infinite edges, since, in this case, the young Castillo searched for the interpretation of the experiment from the strictly mathematical and physical-chemical point of view; others will do so from the physical point of view, only chemical and all areas of knowledge that converge in the wonderful universe of learning science. The importance of relating the sciences, since they will always be interrelated: in this case, this theme exposed by the young Colmenares, with the calculations of the young Castillo. There are many chemistry topics that could be explained and analyzed from the mathematical, physicochemical point of view. All this with the aim of facilitating the understanding of these issues to students of our four engineering, since, in most cases, it is believed that chemistry is foreign to mathematical issues.

It is necessary to put students in a position to face real problems, to express hypotheses, to design experiences to contrast their previous ideas, to propose different problem solving strategies and to analyze the results obtained. To achieve these objectives, it is necessary to include objectives and conceptual contents, that is, scientific and technical knowledge to ensure that future professionals can function in a world increasingly immersed in technological and scientific development.

Chemistry generates from practice creative spaces that can be used to move the student not only to learn the subject but also to like it, to develop in students self-confidence in their cognitive abilities and in their creative qualities; in developing positive strategies for teamwork and communication; and in generating pleasure by satisfying the innate curiosity of human nature, without framing their minds by forcing them to memorize meaningless answers to questions that they never asked themselves.

Reflective Contribution Of Young Colmenarians

My experience when exhibiting Joseph Andrei Colmenares Rodriguez

Within my experience in exhibiting we have to situate ourselves in two moments, the first having everything prepared before the exhibition and the second during and at the end of the exhibition. In the first case, despite knowing that he had a good prepared subject, he also felt some uncertainty as to whether the experiments he was carrying to represent the subject would work, would be seen, and especially if they were to the public's liking. could go wrong crossed my head, perhaps due to the few hours of sleep in the week or simply to know the amount of points that exposure was worth about my final grade. At the moment they give me the signal to start everything changes after a deep and calm respite and I begin with the presentation of the topic, all those fears disappear and as I go deeper into the subject more

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security I begin to feel, but from my point of view All this was possible thanks to the cooperation of the spectator public, because if they had not cooperated, because they were better prepared, nothing would have been the same. Finally, at the moment they let me know my final note, I realize that all the efforts put into this work they had paid off.

Conclusions

1. The experience has been totally satisfactory, since the students have had to investigate, look for information and with this kind of experiences we can make our students be aware of the different options that are presented to them, to compare and value them, favoring their participation.
2. Chemistry generates from practice creative spaces that can be used to motivate the student not only to learn the subject but also to like it.
3. These strategies increase students' self-confidence in their cognitive abilities and creative qualities.
4. It is very useful to put the students in a position to face real problems, to express hypotheses, to design experiences to contrast their previous ideas, to propose different problem solving strategies and to analyze the results obtained.
5. The contributions of the students to the exposed topics always represent an added value to the learning.

References

1. Chang Raymond. (2003). "Química", McGraw W-Hill Interamericana Editores. S. A. de C.V. México.
2. Medio electrónico. Aldebarán; autor: Arturo Ortiz Tapia 2005; Articulo "Plasma" URL:http://www.aldebaran.cz/astrofyzika/plazma/phenomena_es.html
3. Medio electrónico. Mega ciencia; Autor Pablororsk; publicado 3 de septiembre de 2011; Articulo "Condensado Fermionico (estado de la materia); URL: http://megaciencia.com.ar/2011/condensado-fermionico-estado-de-la-materia/

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