Dilemma of A Chemistry Teacher

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Date of Submission: 28th Feb, 2014 Date of Acceptance: 3rd March, 2014

Abstract

'Chemistry' as a subject, dates back to early age of civilization. Since then it has been an integral part of our daily life and has been incorporated in the syllabus of education from school level, which demands a practical knowledge of the subject. Here lies the dilemma of a chemistry teacher, as in the practical classes a student needs to come in close contact with some obnoxious materials which are harmful to the health of the students as well as the environment. Therefore we should develop some alternative approach in devising practical lessons to the students.

Keywords: Chemistry teaching, Toxic substances, Practical experiments, Environment friendly, Green Chemistry.

The word 'Chemistry' evokes diverge reactions among people, from 'Wao'! to 'My God what a ghastly subject!' which is highly interesting. In Sanskrit, "RASAYANA" is the name of Chemistry, meaning full of "Rasa", i.e. "sweet" or interesting subject. In fact, in ancient India, this subject was very much in practice.

In the ancient world, philosophers tried to explain different natural phenomena and they were the fathers of modern science. A group of people, the then scientists, used to experiment by mixing different metals in different proportions to synthesize the ultimate yellow metal "Gold"! Those scientists were called "Alchemist".

With the progress of civilization, science became an everyday subject of common people. From the early years, science is being taught in schools as 'Physical Science' or 'Life Science'. Physical science consists of both Physics and Chemistry and Life Science consists of 'Botany', 'Zoology' and 'Physiology'.

But only textbooks cannot make these subjects interesting. In order to kindle the interest of a child, science has to be experienced by him or her through experiments. In the Physics lab, we can show the child some machines or some toys and show them the technology which is governed by the laws of physics. In case of Biology also, we can show them interesting pictures, or some models. But in case of Chemistry? In the school level, we can make Chemistry interesting by doing some very simple experiments. For example, we can show them the formation of a colorless, odour less gas CO_2 by pouring some lemon juice on a pinch of Sodium bi Carbonate. Okay!

What about the formation of Vanishing Color? If we mix phenolphthalein, an acid base indicator to a solution of ammonia in water, it will form a deep purple coloration, which vanishes immediately when ammonia evaporates. Very good!

Let's come to ten plus two level. We must include a portion of practical classes in the syllabus; otherwise it will be very boring. Under the practical syllabus, there is a topic "Qualitative Analysis of Radicals by Chemical Reactions", Which include Lead, Copper, Zinc, Iron, Calcium, Magnesium etc as basic radicals and Acetate, Chloride , Nitrate, Sulphide etc as acid radicals.

Now, we all know, Lead and Copper are obnoxious metals, which are very harmful for children to handle. Again, Chloride, Nitrate, Sulphide radicals are also very corrosive, which form harmful vapors on treatment by acids. There is a further complication. For schools to obtain necessary amount of different mineral acids to carry out these experiments is also difficult as there are certain Government regulations to prevent the misuse of these acids by antisocial elements. In our experience, most of the schools in our state do not let their students to have hand in experience in this field. Therefore, students who come to colleges with an intention of pursuing undergraduate courses in Science, come almost without any practical experience in Chemistry.

Here comes the dilemma of a teacher who teaches undergraduate chemistry in colleges. In the undergraduate studies both in Honours and General courses, students have to pursue a practical course which consists of qualitative & quantitative organic and inorganic analysis as well as some physical experiments which necessitates them to handle various chemicals which are very much harmful to human health. Take for example, the case of qualitative Inorganic analysis, in which a student must analyse Lead, Mercury, Arsenic, Copper, Chloride, Bromide etc. Which if absorbed in human systems above certain level, might cause a permanent damage in their body, even to their DNA. Specially, for those students who have no previous practical experience, in order to have a fine grasp of the subject, they have to practice more and thus suffer more exposure. Not only by inorganic chemicals, some organic compounds are also very obnoxious, for example, β-naphthol is used almost every day in organic practical classes, which is a very harmful chemical. Again, in some physical chemistry experiments, some organic solvents like Benzene, Carbon tetrachloride etc are used, which are very harmful. Benzene is a known carcinogenic agent.

From all these examples, it is clear, that the practical lessons in chemistry which are in use now a day have some adverse effect on the health of the students as well as on the environment. Also, the teachers and staff who come in touch with all these toxic substances every day, and are exposed for much larger period, suffer as much .There is no such study so as to measure the effect of these on their health. What is the way out then?

There is one branch of chemistry, the 'green chemistry' which is developed in order to overcome such difficulties in an environment friendly way. But this is still under research, and to execute it in everyday teaching is not economically and practically viable. Till then, what should we do? We can use virtual chemistry labs, so that students can have virtual experience in chemistry practical experiments, or should we introduce an alternative syllabus, where students can have practical knowledge of these elements with a need to come across minimum level of toxicity. Without knowledge of the toxic elements, how could our students be good scientists who can detect toxicity in minutest level?

This is an open question, I hope my learned colleagues can enlighten me, and together, we could proceed towards an "**ENVIRONMENT FRIENDLIER CHEMISTRY TEACHING**"?