
Modern Trends of Teaching Chemistry for Digital Natives

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Abstract: Every teacher has to evolve some new methodology to teach his subject. It depends partly on the ability of a teacher how this knowledge percolates to the brains of the students. Evidently “old way” of teaching namely the teacher as “sage on the stage”, is not effective with Digital generation. The teacher now a day has to be creative to simplify the process of teaching and learning and Setting up of a chemistry lab requires lot of financial resources, ample space and good infrastructure to accommodate the chemicals. The online teaching or web based contents allow the student to read the topic of his choice from the article or author he wants to read. Every topic is just a click away from his mouse and his enter key. This makes his studies less boring and more informative.

Keywords: *Teaching, Learning, Methods, Digital Natives.*

Introduction:

The inculcation of ideas, transfer of knowledge, innovations to imbibe a thought and a mechanistic approach to change the raw brain into a learned one is called teaching. If it is an art, it can also be termed as a behavioral science. Right method in the hands of only right teachers can help in the attainment of goals. A method is a coherent set of such links that there should be some theoretical or philosophical compatibility. As these learners of digital century nowadays think and behave differently than those from previous generation. These students were born into world of information and technology; they prefer to multitask rather than focus on one thing at a time, and they can be more attracted to the ideas of a peer or a web video than their teachers have to offer. The teachers who merely follow the textbooks are likely to be perceived as “old hat”. Therefore, teacher’s effectiveness depends on the ability to adapt instruction to the needs of today’s learners. Teaching to the digital learners is not a joke because they want “edutainment” which refers to educational entertainment or entertaining education. The age of old classrooms is over, with the help of latest technology and equipment now traditional classes are changing into smart classrooms. In modern era, technology can act as a mediator for the better learning and teaching processes and raising the standards of learning inputs. Using technology as a tool to help and engage students for creative learning requires hard work for both teacher and student. Moreover, technology assisted classrooms have unlimited benefits such as authenticity, equal learning opportunities, individual attention,

freedom of expression, accessibility, engagement, collaboration, convenience and technological literacy.

The subject of chemistry is an advanced branch of science and it has been using ultramodern techniques in the field of research and development. It has thrived by leaps and bounds to help mankind in fighting many an odd. The success of chemistry can be seen in the field of pharmaceuticals where we are solely dependent on the chemical world for all kinds of medicines to cure our diseases, it may be as minor as paracetamol for pains and fevers or it may be some life saver saving us from lethal diseases like cancer. The food processing is another industry where chemistry proves its point that we can preserve and carry the perishable food articles up to desired destination after properly saving and prolonging their life and can taste them in the part of world where they are only heard and seen in photographs. The pickles and jams coming to our homes are the processed one. There are other countless examples where our households are run by chemistry without our knowledge. Yet the teaching of chemistry in schools and colleges has been done by old and obsolete methods. It is still restricted to two dimensional chalk and board. The rapid competition and boom in technology has made it imperative for the teacher and taught to come out of the old shell and adopt new moulds. Gone are the days when chemistry was done in dingy and stinky horse sheds as done by revered madam Currie and her husband Pierre Currie.

The speed with which the technical world is moving has left no alternative but to adopt the new tools for teaching chemistry. Chemistry till date is taught in the imaginary world where sheer imagination of teacher as well as taught carries all the concepts. Both of them have not seen or felt the fundamental particles around which their discussion revolves. The time has come when we have to create new ideas to show chemistry to students, to give them a live show of chemistry to tell them what is actually happening in a flask .the mere change in colour is not chemistry but a whole process involved in changing the colour is chemistry. Here technology comes to their rescue.

Challenges in Using Technology:

Though various Agencies are trying to bring technology at the doorsteps of students, yet when we talk about actual ground work, these modern instruments are restricted to major towns and cities only. The students of small towns and villages are yet away from them. They often hear about these new inventions but they are yet to get face to face with them. The technically sound teacher is also a meager lot. And the sorry state of affairs aggravates when the people trained by various govt. and non-govt. agencies lean to the cities rather than opting for villages

and small towns to increase the awareness and increase the intelligence quotient of these students. Now a days, everybody has a prized possession of latest gadgets but these gadgets have restricted use of watching movies, playing of games etc. Most of the owners don't know how to put them to teach the practical subject like chemistry with these instruments. They lack the training component. They don't have required skills to use the tools for better teaching of the subject.

According to knowledge dimensions of Anderson and Krathwohl's (2001) taxonomy the matter content of any subject can have following dimensions.

- Factual knowledge which indicate discrete pieces of information available in a subject.
- Conceptual knowledge which inter relates the more complex knowledge forms.
- Procedural knowledge in which skills are involved to perform the application of the subject.

Metacognitive knowledge: The knowledge and awareness of one's own cognition as well as other pertaining to the subject.

The Anderson and Krathwohl's (2001) model includes a continuum of lower-order thinking skills and higher order thinking skills. Both these skills are complementary to each other. These models fit well in teaching of chemistry. The student at higher secondary level needs to develop lower order thinking as he has to set into motion the process of knowing, conceptualizing and acquiring practical approach for chemistry. Thus he has to set up a platform for the higher order thinking. But the teachers teaching chemistry don't follow up to the needs of student. They continuously give the doses of theory and superfluous knowledge to the students rather than coming to their level.

To work upon the improvement of teaching of chemistry and for better understanding of the subject the following tools can be used.

Models: The models can be useful tools in understanding some basic facts about the chemical reactions and chemical behaviours. The use of balls and sticks of different colours and different sizes is an easy tool to create mind picture for a student. We can explain the simple facts like bond strength, bond enthalpy by these models. A ball connected to other ball with three sticks signifying a triple bond and comparing it with another set of balls connected through two sticks to show a double bond can explain the above mentioned facts. Similarly the stability of cyclohexane and the instability of cyclopropane need no further justification if a teacher puts up the structure of these compounds using these balls and sticks. The kekule structure of benzene can also be displayed and explained within few minutes, once the model is in front of the student. The models can explain the elementary concepts of reactions and give partial idea

to students why some reactions are feasible and others are not. The structure of atom, as explained by various workers can be explained through modular experimental set up. The stereochemistry or chemistry of structures cannot go without models. The concepts of chirality, symmetry, mirror image relationships and many other ideas pertaining to optical behavior of various compounds can be easily communicated to students.

Microkits or Miniature labs: Setting up of a chemistry lab requires lot of financial resources, ample space and good infrastructure to accommodate the chemicals. Most of the chemicals used to perform experiments are expensive. Many a time the schools and colleges don't have one or the other thing, thus mostly the practical part of the curriculum remains untaught or partly taught. Even when there are chemicals present in an institute working with them at macro scale always poses a danger of accident due to curiosity or the negligence of the students. The NCERT (National Council for Educational Research and Training) launched a microkit for chemistry practicals. This kit has many advantages. The notable feature of this kit is its portability, having all the required instruments and glassware in a miniature form, thereby reducing the risk of accident due to mishandling of glass. The practicals done at micro level give same results as that of macro levels, use of well plates avoid wastage in large amounts, both in terms of money and chemicals. This also prevents pollution, due to portability the students of far flung areas, where large and delicate instruments are difficult to carry, can now do the chemistry at their doorstep in actual practice. In these micro-kits small apparatuses are also provided like wet cells commonly known as „battery“ which students can make with their own hands and feel the utility of chemistry which may ignite their minds to move more seriously towards a career in chemistry.

Kitchen Chemistry: The chemistry as a subject may be dry and boring to a student when it is taught theoretically without citing examples from day to day life. If the common household examples are incorporated intelligently by a teacher it can be more interesting e.g model of atom can easily be correlated with planetary motions, solutions can be elaborated with the examples of soft drinks and homemade cold drinks, packed juices and liquid medicines etc. Surface chemistry can be easily discussed when talking about white wash, paints, removal of stains from clothes etc. Making of popcorns from corn seed is an example of fast reaction while growing of plants and other living things is a slow reaction. The dry cells used in torches and the batteries used in vehicles can explain the electrochemistry. Thermodynamic features can be felt by observing the energy changes when salt is dissolved in water to show the endothermic and adding a little of sulphuric acid showing the endothermic nature of processes.

There are almost all the topics of chemistry whose shadow can be felt in daily routine processes, the only beauty lies in building their interrelationship.

Smart classes and educomp programs: This is the latest technique evolving in the field of teaching ,learning process. It is called smart education which integrates technology in the form of software's, the learner and his parents, online and offline educators. It helps the students in understanding the concepts in a better way. The software is used to cover the different aspects of a subject and the topics are shown on the projector in the class room or a suitable dark room. Many a topic whose theoretical explanation seems to be illogical to the students is easily chewable when projected on a screen, e.g. the nuclear fission showing different fragmentation pattern is easy to explain using an educopm application. The educopm program contains graphics, 3-D diagrams etc., this transforms the concept into a mind maps easy to remember in the images saved in the hard-disk of the brain. The students who miss out some lectures or they want a revision of certain topics can restart the program, run the software and start learning at the click of the mouse . The concept of smart classes is like a virtual school where teachers, students and their parents can communicate with each other. Various smart class websites are operating to facilitate and develop the knowledge quotient of students. These websites are also backed by reputed knowledge houses.

Audio Visual Aids: One of the reasons for failures to attract students to chemistry is in the way it is taught and the way tests taken don't match the students learning and gaining capacity. Though individual learning capacities are never the same yet the education systems are unable to match the demand of most of the students. Chemistry can better be taught with audio visual aids like overhead projectors or computers. The computers are with us for two decades now but in real terms they have proved futile and remain as mere show pieces in these institutions wherever they are. This can be attributed to the fact that the technology is not matching with innovation. These machines present in the institutions don't have updated and required softwares to cater to the needs of the students. Each and every student can understand mechanistic approaches and various other processes if they are given proper presentations through power point presentations or graphical presentations on the computer.

Online learning: Technology is slowly changing the scenario of education. The earlier teacher centric approach has now changed into student centric.. There are a large number of frameworks through which a student can learn make learning design. According to Oliver et.al., "learning designs are learners and a space where they act with tools and devices to collect and interpret information through a process of interaction with other (Oliver, Harper,

Wills, Agostinha and Hedberg 2007 p. 65). Various websites allow the contents to be freely downloaded and also the queries to be uploaded by the students. These websites serve as important tools to promote and enhance the web based knowledge by interlinking teacher and taught through large distances overcoming the language barrier. Various softwares are available to translate the queries from one language to other and bring back the answer in desired language. Government agencies are also trying their level best to enhance the knowledge of students in chemistry through various channels like Gyandarshan run by Doordrshan and the different programmes aired on All India Radio. These channels also hold the live interactive session with the students sitting across the miles.

Conclusion:

The students don't learn or don't show the interest in learning new things due to complex process of learning and teaching. Teacher has to lean forward to the level of the student to generate interest in him. A teacher of chemistry may mould a simpleton into a Nobel laureate, a creator of novel drug, a discoverer of a new phenomenon, an alchemist. The only deficiency is lack of self-belief to be a good chemistry teacher and will power to be a transformer of society.

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