

## Active learning and Project based Learning in Chemistry

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### Abstract

Chemistry is one subject which gives adequate knowledge about the applications involved in the aerospace, mechanical, environmental and other engineering fields. Knowledge of chemistry plays a significant role in engineering profession enabling the engineers to understand and to perform successfully while working on multidisciplinary tasks. There are many advances in scientific knowledge and innovations in educational field that necessitates constant changes in engineering curricula. This is for the benefit of society. There are tremendous innovations and drifts in medical education that have been undertaken across the board which include self directed learning, problem based learning, integrated teaching and community orientation, etc. This paper tries to mention the teaching strategies that have been adopted by the faculty to inculcate interest in Chemistry even in their further education. The effectiveness of Information and Communication Technology is tried to create interest and to develop the student's practical and transferable skills. The students of the B Tech I year study the subject so mechanically and strive hard to get through the exam ignoring its importance in solving problems involved in real life situations. Hence, the authors shifted the focus from teacher-centric to learner-centric approach. By adopting Active Learning strategies such as Project-Based learning in the labs and active learning strategies in the class rooms through discussions, using Information and Communication Technologies and encouraging the students to learn by self while doing some problems. The authors would like to share certain strategies that they have adopted and the results that they found through this paper.

**KEYWORDS:** Self directed learning, Active Learning Strategies (ALS), ICT, Project – Based learning

### Introduction:

In the traditional learning environments, it is the teacher who transfers the knowledge through text books and other printed materials. Technology usage and practice of involving the students to collaborate is not seen. If we consider the laboratory, the student's activity is predetermined and they get very little experience in solving the problems. The laboratories classes are systematized to involve the students performing the instructions given in the lab manual. Each step of procedure is given and the students are asked to follow the procedure. Hence, the students do not cherish their experiences in the lab. Their performance is mechanical. Instead of encouraging the data interpretation, such type of lab work encourages data processing rather than data interpretation. Hence, the focus should be shifted from teacher-centric to learner centric. The teachers decided to be the facilitators. They adopted Active Learning Strategies to use in the classroom and Project-Based teaching to solve the problems by involving the students to get

practical experience. Since, the college has to follow the prescribed curriculum; the method of teaching is changed.

### **I.Active Learning Strategies:**

By using Active Learning Strategies, it is conceived that the students will not only come to a deeper understanding of the issues involved but also their motivation and learning enthusiasm will be heightened. In this paper, we describe the process of adopting Active Learning in a lecture based multidisciplinary course , certain initial hiccups created problems but the strategies that have been adopted to overcome the barriers, we selected certain strategies in the class room. When a traditional lecture course was structured to be more interactive, the achievement gap disappeared.

- a. Information and Communication Technology:** ICT-based learning brought about an increased tendency towards collaborative learning among students and teachers. ICTs, which include radio and television, as well as newer digital technologies such as computers and the Internet-, have been touted as potentially powerful enabling tools for educational change and reform (Tinio, 2003). Today computers are both a focus of study (technology education) and a support for learning and teaching (educational technology). Hence, Internet and NPTEL sources and PPTs etc have been used by the teachers and the students are advised to prepare for presentations. This in turn stimulated the confidence and they are prepared to share their learning.
- b. Laboratory Training Model:** It focuses on the first hand information which comes from research and laboratory. The teacher created a learning environment is provided in a way that the students have to find the solution to the problem.

### **II. Project Based Learning:**

The primary distinction of Project Based Learning with other student-centered learning methods is that it focuses on introducing concepts to students by challenging them to solve a real time problem. The main outcome of this learning process is that the students work in small collaborative groups, take the decisions and share the responsibilities.

- a. Group Discussion:** It is hard to imagine learning to do science, or learning about science, without doing laboratory or field work. Experimentation underlies all scientific knowledge and understanding. It refers to a particular form of a group interaction where members join together to address a question of common concern, exchanging different points of view in an attempt to reach a better understanding of the issue. Laboratories are wonderful settings for teaching and learning science. They provide students with opportunities to think about, discuss, and solve real problems.
- b. Group Work or Collaborative Learning:** It promotes learning goals rather than performance goals. Effective teams or groups assume ownership of a process and its results when they are encouraged to work together towards a common goal.

The comparative study was made in the class room for two groups. For group A traditional black board teaching method was followed and for group-B the ALS was implemented.

The study showed that the group-B performed excellently & their overall performance increased. The performance of the other group proved as passive as they reproduced what they have memorized.

The author has developed a unique teaching methodology to various chapters of chemistry. A brief overview on the methodology followed is explained below.

i) Most of the students feel *organic chemistry* is difficult to understand. In order to create interest in the subject the author has explained through animations and after every class assignment on the topic taught was given.

ii) In order to understand the concepts of *electrochemistry & corrosion*, the students have been given a task to construct a cell with the available resources in the laboratory & explained the concept.

iii) To understand the process of reverse osmosis, an assignment was given for a group of 6 students to prepare a dummy model of it, using available material at home. By using the model they were asked to present the subject to the class. This activity created a healthy competition among the students. The passive learners too showed interest in doing activity.

To make the concept of viscosity better they were given a project by collecting various oil samples. After performing the reactions & doing separation techniques followed by purification & testing. The students are able to define clearly the properties of oils & its significance.

Though the traditional teaching has the charm of giving the pen and paper test purely based on the student's retention power, the active learning technique has been used by the author on experimental basis proved good results in subject like engineering chemistry and the results are shown in the Table below.

Learning outcome	Active Learning Method	Traditional Teaching Method
a. Communication skills	72	65
b. Presentation skills	80	70
c. Group discussion skills	81	70
d. Attempting the tests	85	71
e. Result in the end exam	86	70

## Conclusion:

From the observations made in the class room we conclude that, ALS in chemistry has involved students in the learning process. Students showed interest in activities like group discussions,, documenting the known information and sharing it with peers. Being a teacher we can become the facilitators to judge whether learning has happened. Notable learning outcomes observed in students are Healthy competition among the students, Increase in motivation, Interest in collecting & sharing the information, Increases self learning and Improves presentation skills.

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