

Pedagogical initiatives by individual faculty as a part of 'Student Centric Learning'

1. Learning by doing:

A: Herbaria preparation-

This is a unique method of learning where students have been asked to visit fields for the collection of medicinal plants. In the beginning, students are guided about selection, collection and observation of medicinal plants. After collection of the specimen, students have been demonstrated regarding preservation techniques of the plant specimen. Students are asked to mount the dried specimen and record the field characteristics. Hence, every herbarium is a voucher specimen for authentication and future reference.

This method of preservation is extremely important since researchers and Ayurvedic practitioners across the area visit the herbarium as a reference material and it provides an ideal platform for collaborative and interdisciplinary learning.

PO's attained: PO1, PO2, PO3, PO4, PO6, PO9, PO11

B: Preparation & preservation of permanent slides-

In this method, students are guided for the study of unique internal characters of various crude drugs. Since, the characters are highly conservative, constant, consistent and characteristic, they are extremely important for the authentication of herbal crude drugs.

The method consists of preparation of permanent slides by taking transverse sections. The students are given demonstration about the section cutting, staining and techniques of preparation of permanent slides. The slides have been observed under digital microscope and photographed, along with its detailed description of diagnostic characters. These slides are often flashed as templates before performing the practical for new entrants for their ready reference and easy of doing.

This method is extremely important to observe the live field characters of different stages of the growth of crude drugs which is useful for monographic study.

PO's attained: PO1, PO2, PO3, PO4, PO6, PO9, PO11

2. Use of Multiple Choice Questions (MCQ) Flash Cards:

In this method of learning, students have been asked to design flash cards with multiple choice questions on different topics incorporated in curriculum. Every student has designed five flash

cards with different MCQ questions of the topic allotted to them. In this method, learners are motivated; stay focused and keeps moving forward. Moreover, this method eases faculty to evaluate learning progress and outcome. This method promotes inquisitiveness, logical reasoning and in-depth knowledge.

PO's attained: PO1, PO2, PO3, PO4, PO8, PO11

3. Preparation of 3D model for stereochemistry

This is a unique method of learning which boosts creativity, inquisitiveness, spatial visualization, perceptual speed, inductive learning, and visual perception. Molecular structure of different drug is highly intricate and available only in 2D form which is a major hurdle in understanding the 3D structure of drug specially in understanding stereo chemistry. In this method, an attempt has been made to design and developed 3D models of drug in order to understand the structural arrangement in space, bond, bond distance, angle, orientation, configuration, confirmation and proper dimension which is highly difficult to explain and elaborate with the help of 2D model. In this exercise student are given detail input regarding the designing of molecular model by using Darling Flexible Molecular Model Kit which has an interesting arrangement of push and pull coupling system. The students of Final Year B Pharm. have been assigned a drug to design and develop its 3D molecular model by using molecular model kit. This work was assigned as a part of theory curriculum. Students have designed and developed 3D molecular model of a given drug and described the mechanism of formation, orientation, configuration, and dimension of the molecule. Students have developed a deep insight while crafting the 3D model which is difficult to understand the scenario with the help of 2D model and plain text. This method has generated interest in student by getting better context, a greater sense of perfection, visualization, conceptual understanding, and more engaging activity. This allows students to better connect with learning material. This technique has sharpened critical thinking, problem solving, conceptual understanding, and application skill which is a basis for the development of analytical reasoning and decision making. This method also enables students to develop self-directed learning skills. Students do develop a feeling of accomplishment for getting in-depth knowledge and skills. In this method students are more focused engaging self-motivated for getting insight knowledge of the subject.

PO's attained: PO1, PO2, PO3, PO4, PO7, PO8, PO11

4. ICT-enabled learning:

This is a new age learning method of teaching. In this method, conventional method is adopted for the delivery of lecture. However, certain steps in the chapter like flowchart, complex diagram, graph, manufacturing process, drug delivery etc are intricate steps to convince students. It is beyond their scope to grasp the concept by conventional method. At this juncture, video clips of above mentioned concepts are flashed in the classroom to make a subject easy and understandable. In this way, conventional method has been blended with advanced method by using Information and Communication Technology (ICT) solutions in order to boost the knowledge, analytical ability and usage of modern tools.

PO's attained: PO1, PO3, PO4

5. Blended learning:

Blended learning is an amalgamation of face to face learning and using multimedia i.e. use of animated video clips to make the learning more meaningful and understandable. In this method, the face to face discussions are blended with animated video clips when the concept or mechanism is very intricate and difficult to understand by learners. In this context, blended learning is more effective and boosts the conceptual understanding of students. The face to face learning blended with multimedia makes the learning more meaningful, fruitful, and result oriented. In this method, it has been observed that students develop critical thinking and also use lateral thinking due to the exposure of multimedia techniques.

PO's attained: PO1, PO3, PO4, PO6-PO9, PO11

6. Ethical Learning:

This is an ideal method of leaning to develop conscience and consciousness related to health safety, environment and pollution. In this method students are trained and updated with various precautionary measures and safety norms of chemistry laboratory regarding use of various grades of chemicals. Students are also given thorough understanding about use, handling & disposal of hazardous chemicals. Lastly a common test based on laboratory safety is conducted by giving multiple choice questions to analyze skill, knowledge, awareness regarding safety and health hazards. In this test, failures must reappear for the test in order to bring complete awareness about the principles, ethics & practice of chemistry laboratory. This exercise has been assigned

in the form of credits to students. This method of learning was particularly found effective and beneficial for beginners or newcomers.

PO's attained: PO1, PO3, PO4, PO7, PO9, PO10, PO11

7. Content Delivery through animated videos

The lectures and practical demonstrations are conveyed through youtube channel. Animations are involved in designing the videos. Content is displayed on the youtube channel and reviews & comments are addressed. Significance of this method are that animations and videos boosts conceptual clarity. It is an easier tool for last minute revision. The play, pause and rewind option adds convenience in learning. Missed lectures or practicals can be understood with ease and Wide range of audience can be addressed and their queries can be addressed.

PO attained: PO1, PO2, PO3, PO4, PO6, PO7, PO8, PO9, PO10, PO11

8. Student-centric learning:

Students have been assigned seminars on different topics prescribed in the curriculum. Besides, the students are given complete guidance of the exhaustive literature required for the seminar preparation. Students are asked to give powerpoint presentations in the class. Every powerpoint presented and elaborated by the presenter is rigorously discussed among the students. Students are asked to prepare a thorough presentation of the topic by using powerpoint presentation. During presentation, the other students of the class are permitted to ask questions regarding their queries. Meanwhile the discrepancies noticed in the presentations were compensated by the faculty by additional inputs. Thus the faculty has facilitated to present the topics in the form of lecture or presentation. In this exercise the student apply critical thinking and lateral thinking to make subject more precise and concise. Here, students meticulously evaluate, analyze, consolidate and integrate the information to simplify various concepts. Hence, this is a new age learning method where students are made autonomous to develop insight of the subject.

By applying this method, students become technosavy and familiar to the use of ICT solutions in learning. The participation of students in discussion enhances the interactive and participative learning. It also boosts the communication skills of learners thereby enhancing the knowledge and learning level of the learners. This method boosts confidence, conceptual understanding and application skill in students.

PO's attained: PO1, PO2, PO3, PO5, PO6, PO8, PO9, PO11

9. Quick Review Method:

This is a unique method of the compilation of the information in a more precise, concise and condensed form. In fact, it is abstract information depicted to get the overview of the subject at a glance. This method is referred as a ready reckoner to understand the entire scenario of the concept at a stretch. This method is learner centric teaching method which may be practiced for all the subjects and it has helped to improve the core ideas of the specific concept. This method promotes self learning, analytical ability and lateral thinking. Moreover it has enhanced competence and confidence of the learners.

PO attained:PO1, PO2, PO3, PO5, PO7, PO8, PO11

10. Flexible molecular based learning:

This is a unique method of learning which boosts creativity, inquisitiveness, spatial visualization, perceptual speed, inductive learning and visual perception. A molecular structure of different drugs are highly intricate and available only in two dimensional forms which is a major handle in understanding the 3-D structure of drug in stereochemistry. In this content an attempt has been made to design and develop 3-D models of drug in order to understand the structural arrangement in a space, bond Angle, bond distance, orientation, configuration, conformation and proper dimensions, which is highly difficult to explain and elaborate with the help of 2-D model/structure. In this exercise, the students are given detail inputs regarding the design of molecular models by using Darling Flexible molecular model kit which has interesting arrangement of push and pull coupling system. Subsequently, each student of the final year has been assigned a drug to design and develop its 3-D molecular model. This work was assigned as a part of credit in the theory curriculum. Students have designed and developed the 3-D molecular model of given drug and described the mechanism of formation, orientation, configuration and dimension of molecule.

This method of learning has enhanced creativity, critical thinking, problem solving and application skills. This method has generated interest in the students by providing better context, a greater sense of perception, conceptual clarity and more engaging activity. This allows students to better connect with learning material. They offer more interesting and involving way to imbibe information. This technique has sharpened critical thinking and conceptual understanding of the learners which is basis for the development of analytical reasoning and decision making.

Moreover this method enables students to develop effective self directed learning skills. Students also develop the feeling of accomplishment for maintaining new knowledge and skills; infact this method of learning helps to develop students focus learning environment, students to get self motivation and in depth knowledge of this intricate subject.

PO's attained: PO-1,PO-2, PO-3,PO-4,PO-7,PO-9, PO-11

11. Creative Learning:

In this method, students are asked to design histological models of internal morphology to authenticate the crude drugs. The students have been given complete knowledge for designing unique characters that are frequently used in pharmacognostic studies. Students do design ingeniously models of trichomes, stomata, calcium oxalate crystals, vessels, trachieds, leaf architecture etc.

This method has boosted creativity, imagination and designing skills of students.

PO's attained: PO1, PO2, PO4, PO11

12. Self Learning:

This is an advanced method of learning where students are chased and challenged to apply their knowledge and skill to make the subject more easy, interactive and understandable. In this method, group of students identified & topic incorporated in curriculum are assigned to them, besides inputs of literature are also provided to group to ease their work. Students refer different literature on principles, procedure and mechanism of reaction. Students have developed video clips of concern topic of chemistry to make subject understandable and interesting. In this process students apply different methods to elaborate, explain and simplify facts more precisely and concisely. Moreover students get acquainted with exhaustive literature available in subject and cultivate habit of self learning. Videos are uploaded on YouTube to provide open accessibility & it is observed that the work carried out by students got very favorable comments and "likes" in this regards.

PO's attained: PO1, PO2, PO3, PO4, PO5, PO7, PO8, PO9, PO10 & PO11.

13. Flipped classroom:

Flipped classroom is a type of Self learning where Instead of students being taught the foundations of a topic in the classroom and then using homework and assignments to individually expand and explore the topic, the flipped classroom model requires students to acquire foundational

knowledge through self-study at home before using class time to delve deeper into the topic under the guidance of the teacher. The pandemic caused a surge in the use of the flipped classroom model, proved that this pedagogical approach can transcend time and location, offering unparalleled flexibility for all involved. The key benefits of flipped classroom are-

1. Flipping allows students to learn at their own pace.
2. Flipped learning is customized, active, and engaging.
3. Flipped lecture videos help students review for exams and master the content.
4. Flipped content can be richer through curation and continuous improvement.
5. Students in flipped classrooms may show better learning outcomes.

PO's attained: PO1, PO2, PO3, PO4, PO6, PO7, PO8, PO9, PO11

14. Mind map method:

Mind Mapping is a learning technique which uses a non-linear approach that encourages the learner to think and explore concepts using visual-spatial relationships flowing from a central theme to peripheral branches which can be inter-related.

The great advantage of a Mind Map is that it literally "maps" the way a person's brain sees and creates connections; once mastered, it brings incredible clarity and ease to decision-making process, using all of the ways the brain processes information - word, image, logic, number, rhythm, colour and spatial awareness, so that the person is literally thinking with his or her whole brain. Because of these benefits, the use of Mind Mapping holds promises as a technique to aid students in learning.

PO attained- PO1, PO2, PO6, PO7, PO8, PO9, PO11

15. Graphical abstract designing:

This method is applied for experiential learning. The detailed process is explained to students at the start of practical. Experiment is performed by students under the guidance of the teacher. While performing practical, photographs are taken & maintained for each step. All photos are arranged as per appropriate sequence along with caption for each step by students to make graphical abstract. All the graphical abstracts are prepared under the guidance of concerned teacher. The color prints of all abstracts are attached in journal. The objectives for this method are to develop presentation skills amongst learners, collaborative work culture, to involve students for better cognition, to express their methodology in concise manner.

PO attained- PO1, PO2, PO3, PO4, PO5, PO6, PO8,PO9,PO11

16. Collaborative method of teaching and learning:

This method of teaching and learning has been implemented in theory as well as practicals to enhance and improve the learnability of students. In this method a group of five students has been identified in which three students were advanced learners and two were slow learners based on the overall performance of the students. At the outset, topics of the theory and practicals have been sorted out from the curriculum. The students were asked to select the topics of their choice in order to make the process easy and practicable. Besides the topics, students were also given exhaustive literature of the concerned topic for each group. They were also given proper guidance regarding planning, design and implementation. Moreover, students were given understanding about the benefit and outcome of this method. After the completion of illustrative charts of the topics distributed to different groups of students, the charts are evaluated for its precision. Subsequently students are asked to present these charts to the class. Before presentation, all five students of the group have mutually consulted and decided to present the specific part of the topic as per their convenience. During presentation the other students are given time to ask questions about their doubts. Lastly the whole exercise has been video recorded for the future use as a source of motivation and information.

This method of teaching-learning has enhanced knowledge, planning ability, communication skill, leadership, conceptual clarity and collaborative learning. Lastly the slow learners have been improved and enhanced their learning competency.

PO's attained: PO1, PO2, PO3, PO5, PO8, PO11

17. Experiential Learning

Experiential learning is Aristotelian logic of learning expounded by David Kolb. This method is followed during practicals. In this method, a group of three to four students have been formed clubbing slow learners with advanced learners and they have been assigned an experiment. While performing this experiment, students have worked on different aspects i.e. one participant has presented the protocol while another participant has elaborated about its applications and third member has elaborated its conclusion. The entire presentation of student has been video recorded and can be used in future as ready reference for learners as a source of motivation and inspiration. In this method, students have experimented, reflected and conceptualized.

This method has holistic perspectives which include experience, perception, cognition and behavior. This learning cycle basically involves concrete learning, reflective observation, abstract conceptualization and active experimentation. The learners are attracted to new challenges and can solve problems intuitively. This learning process also involves conceiving new ideas, evaluation, analysis, interpretation, generalization and conceptualization. Learners also get exposure to real life problems which are correlated with the learning solution. Learners do develop multidimensional thinking, lateral thinking, critical thinking, analytical ability and application skills.

PO's attained: PO1, PO2, PO3, PO 5, PO9, PO10, PO11.

18. Survey Based Assignments

At undergraduate level, Students study, formulate and evaluate conventional dosage forms. Such conventional dosage forms are easily available in market and students are well exposed to them quiet well as everyone is buying and using these conventional dosage form routinely. But same is not true when it comes to the Novel Drug Delivery Systems (NDDS). So the prime objective of this method is to make students aware about the current status of Novel DDS in market. The students were allotted a certain type of DDS which is categorized as novel. The students need to go through in detail about theoretical aspects and prepare an assignment. Students collect data about the available marketed products for the allotted DDS through using survey method. This acquaints students to therapeutic categories of drugs converted in NDDS, formulation aspects, applicability, prices, and current status.

PO's attained: PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8 and PO10

19. Projects based learning:

It is a unique method of student centric pedagogy where students integrate the information by knowing and doing. In fact, this activity involves either assignment of small projects or field work. Projects based learning is a collaborative activity which involves planning, designing, analyzing and drawing conclusions and lastly sharing the ideas within a team. The team comprises of slow and advanced learners. In this method, projects are assigned to a group of two to three students including slow learners and advanced learners in order to inspire and motivate slow learners to improve the overall performance. This method is applied for the environmental studies where students have been assigned major environmental issues which have profound

impact on sustainable life. The students as a team have explored the major issues like water pollution, air pollution, solid waste management, hospital waste management, water harvesting etc in which students have compiled exhaustive information and lastly draw fruitful and meaningful conclusions. The students are also assigned short projects like monographic study of medicinal plants, herbarium, review of pharmacological and phytochemical characters of a medicinal plant, etc.

In this activity, students acquire deeper knowledge through experimentation, exploration, field collection, acquiring knowledge of real world challenges and problems. The students learn about the subject by working for an extended period of time to investigate and respond to a complex question, challenge or problem. Moreover it is a new age learning to acquire knowledge by way of application of thoughts, reflection and conceptualization to arrive at a tangible solution.

This activity boosts leadership qualities, inquisitiveness and ingenuity among students. Moreover, this method was found to inculcate cooperative learning in order to motivate slow learners to be in line with advanced learners.

PO's attained: PO1, PO3, PO5, PO9, PO10, PO11

20. Designing Learning Charts:

This is a unique method of learning where slow learners have been clubbed with advanced learner to design learning charts by using advanced information from multimedia. In this method a group of eight to ten students have been asked to design learning charts of the topic included in their curriculum. The students are also given inputs about literature used for their exercise. It is observed that students have designed very precise and concise learning charts of different topics assigned to them. These charts were displayed in laboratories for the reference and observations. The students of concerned class are regularly exposed to these charts in order to remember and understand the concepts included there in.

This method of learning has enhanced analytical ability and conceptual clarity of the subject.

PO's attained: PO1, PO2, PO4, PO5, PO6, PO7, PO8, PO9, PO11

21. Develop Working and 3D Model:

This is a unique method of learning which boost creativity, inquisitiveness, special visualization, perceptual speed, inductive learning and visual perception. The developed apparatus is useful for determining the spreadability of all semisolids samples. Spreadability of gels, creams, ointments

and lotions is the net result of a combination of rheological contributions, of which viscosity is just one. In addition, structural and viscoelastic characteristics that describe the rigidity, strength and relative contributions of elastic and viscous behavior play a major role in imparting spreading properties. Spreadability is the ability of a cream to spread on the skin. It plays an important role in the administration of a standard dose of a medicated formulation to the skin and the efficacy of a topical therapy. Spreadability is the ease with which a product can be spread. It is commonly a desired characteristic of margarines, butter, jams, chocolate spreads, etc. but is also an important characteristic of ointments, creams and waxes. Cosmetic creams and lotions generally show shear-thinning behavior. This means that the viscosity is not a constant value, but depends on the shear intensity. This correlation is described using the shear rate. How strong the shear is during spreading depends on the sample and application. In this method students develop Working and 3D Model for Spreadability test Apparatus and also taken Design patent and copyright on the same which help students to develop awareness about IPR and students become more focused and self-motivated for getting insight knowledge of the subject.

PO's attained: PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11.