Effective And Interactive Class Room Teaching

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Abstract

Basic science and technological subjects are becoming unpopular and somewhat loosing relevance in the eyes of present day average undergraduate students. Research and present day experience have shown that class room teaching of these subjectsneither full fill the requirement and aspirations of the students nor promotes higher order of cognitive and practical skill.Most of the students subject teaching is not so interesting because of the

- Inadequate knowledge of the basic concepts of the subject at school level
- Poor understanding of language/medium of instruction.
- Compartmental surface learning of the subject concepts without appreciating their inter connections.
- Unequal contents of the syllabus of various papers of the subject.

An attempt has been made to make effective and interactive classroom teaching by using concept maps based on constructivism learning theory and V-diagramming to correlate theoretical concepts with experimental observations. Following cognitive tools which can be used in a particular situations in the classroom teaching include:

- Root cause-effect analysis techniques using fishbone diagram
- Issue diagram – breaking down problem into small fragments to obtain overall final solution
- Affinity and matrix diagram

Experience had shown that use of these cognitive tools as and when required helped in making shrinking classroom teaching days more effective and interactive in the present day scenario of higher education in Madhya Pradesh.

Key words : Effective Teaching ;Cognitive tools ;Concept maps; V-diagramming

Introduction

Higher education is now a days undergone a change in its prospective as it's expected dimensions include [1]

- **Product Dimensions**: Performance, Reliability, Durability and Serviceability
- **Software Dimensions**: Correctness, Reliability, Efficiency, Integrity, Usability, Maintainability and Portability.
- **Service Dimensions:** Reliability, Responsiveness, Competence, Courtesy, and Communication

These have found wanting because of the shortcoming of present day teaching some of them are:

- Subject contents are becoming unpopular/dull and irrelevant in the eyes of students
- It does not promote higher order of cognitive skill[2]
- It leads to gaps between students aspirations and teachers expectations
- It is not changing to keep pace with the present day requirements because teachers are reluctant to accept the change.

Present Day Challenges in faced by teachers in class room teaching are mainly due to[3]

- Inadequate background of subject of students at school level
- Poor understanding of language /medium of instruction
- Compartmental surface learning of topics without appreciating connections between them.
- Unequal contents of units/papers
- Insufficient ever reducing number of teaching days
- Lengthy description leading to confusion of important concepts of the subject

The present communication is an attempt to provide a brief overview of the use of some of the cognitive tools in actual class room teaching (of chemistry)during past years.

The Concept Map

A concept map[4] an important and widely usedcognitive tool which represents conceptual teaching and learning using relationships amongst the set of connected concepts of a topic.It was first developed by Joseph D. Novak and his research team in the 1970s based on the cognitive theories of constructivismIt is a type of graphic organizer which begins with a main idea (or **concept**) and then branch out to show how that main idea can be broken down into specific topics used to help students organize and represent knowledge of a subject. It can be constructed by identifying important facts/terms of a topic and after arranging them according to their relevance/significance develop cross/single links amongst them.These connections/links expressed by short phrases which can be used to elaborate the subject contents and to identifyindividual/collective problems/difficulties. These can be represented either in *Spider form*by placing the central theme or unifying factor in the center of the map outwardly radiating sub-themes surround the center of the map or in *Hierarchicalform*which depicts information in a descending order of importance with most important information is placed on the top or most commonly in a *Flowchart* way which organizes information in a linear format. In classroom concept map has been used regularly to teach various topics of (physical) chemistry and also for internal evaluation [5]

Gowin's Knowledge Vee

The **V-diagram**[6] is a graphical representation of a development cycle of a system. It describes the activities to be performed and the results that have to be produced during system development. The left side of the "V" represents the decomposition of requirements, and creation of system specifications. The right side of the "V" represents integration of parts and their validation.The important aspects of V-diagram is **Validation**which assurances that a product, service, or system meets the needs of the customer(students) and other identified stakeholders and the other is **Verification** involving internal evaluation of a product, service, or system is in accordance with the established norms or not. The V-model provides guidance for the planning and realization of goal of the system in terms of concrete assistance on how to implement an

activity and its work steps improvements of transparency in communication with the desired uniform quality. In the context of teaching the use of V-diagram addresses to gap between students' ability to correlate their practical observations (laboratory experiments) with the theoretical concepts introduced during regular classroom teaching from the prescribed text book material. At the top of Vee diagram the focus question or target and at the bottom center points of investigation are placed. On the left side concepts introduced during classroom teaching and on the right side experimental methodology/ observations are kept and then the students' are asked to identify the interrelation between the two sides of vee. This has provided an opportunity of interactive teaching with positive feedback from the students[7]. The regular use of these cognitive tools with encouraging feedbacks by students has prompted to use following in classroom teaching and refresher courses for teachers.

Root Cause Analysis Technique – *Fishbone Diagram*

A **fishbone diagram**, also called a **cause and effect diagram** or **Ishikawa diagram**, is a visualization tool for categorizing the potential causes of a problem in order to identify its root causes.It was first created in 1943 by Professor Kaoru Ishikawa of Tokyo University[8] and adopted by Dr. W. Edwards Deming. The cause and effect(CE) Diagram is basically used to investigate a problem, exploring, identifying, and displaying the possible causes in a given situation .The diagram clearly describe the problem (effect) and the detailed factors as causes that contribute to the problem .The left side of the diagram is where the **causes** are listed which are broken out into major cause categories whereas the right side of the diagram lists the **effect**. The effect is written as the problem statement for which identification of the causes are attempted.Common uses of the Ishikawa diagram are product designand quality defect prevention to identify potential factors causing an overall effect. Each cause or reason for imperfection is a source of variation. Causes are usually grouped into major categories to identify and classify these sources of variation. The *defect* is shown as the fish's head, facing to the right, with the *causes* extending to the left as fish bones; the ribs branch off the backbone for major causes, with sub-branches for root-causes, to as many levels as required. is intended to reveal key relationships among various variables, and the possible causes provide additional insight into process behavior. The root-causes emerge by analysis, often through brainstorming sessions, and are grouped into categories on the main branches off the fishbone. Themaking

diagram is of educational value in itselfwhich outlines variousrelationships and a perfect guide for discussion which can lead to improvement of the learning process. It has been used in teaching (chemistry) for the identifications of various causes which are the reasons for inaccurate estimations in laboratory sessions. Once the a particular cause is identified with its contribution to final result then remedial measures are taken for further improvement.

Issue Diagram

It is an effective method for breaking down problems into several issues in the form of questions and then formulating solution(hypotheses)to each individual issue. It can also be viewed as alternate of fishbone diagram. In teaching (chemistry) particularly multi step synthetic procedures and mathematical derivations it is a common practice to explain every individual step and then integrating/summarizing outcome(end product) of all steps.[9]

Affinity diagram/Chart(or) K-J method

An affinity diagram organizes ideas, problems and their respective solutions into related groups which helps in categorizing and organizing a large number of fragmented uncertain information into a logical cohesive group.It is a business tool used to organize ideas and datainto their natural relationships which was created in the 1960s by Japanese anthropologist KawakitaJiro(KJ).This method can be used to taps a team's creativity and intuition.in teaching(chemistry) some interrelated topics can be discussed in separate groups and a common connectivity can be derived.

Matrix Diagram (or) Matrix chart

The matrix diagram shows the relationship between two, three or four groups of information. It also can give information about the relationship, such as its strength, the roles played by various individuals or measurements L-shaped matrix relates two groups of items to each other (or one group to itself) whereas T-shaped matrix relates three groups of items: groups B and C are each related to A. Groups B and C are not related to each other

andY-shaped matrix relates three groups of items. Each group is related to the other two in a circular fashion.

Conclusion

Teaching is an ongoing experimental process requires to modify and readjust as per ever changing requirements of the students. Effective flexible adaptation of teaching procedures of any other discipline into regular available limited classroom teaching time in the present day higher education scenario in our state.

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