



Teaching-Learning Process for Academic Excellence and to Achieve NEP-2020 Goals

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Teaching-Learning Process for Academic Excellence and to Achieve NEP-2020 Goals

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Abstract—Due to major reforms in new National Educational Policy (NEP-2020), Teaching-Learning process demands paradigm shift in its fundamental approach especially for engineering subjects. One of the challenges for a teacher is “how to deliver subject effectively to achieve NEP objectives i.e., skill enhancement of student from conceptual perspective and entrepreneurship perspective. In this paper, we attempted to resolve this bottleneck with our proposed “Teacher-Student One entity (TSOE)” methodology. This TSOE methodology is developed based on the idea of “Teaching-Evaluation-Revision (TER)”. A pictorial representation of TER is provided for clear explanation of our methodology. Furthermore, a case study is conducted to validate our methodology with an engineering subject. The results demonstrate a significant improvement in the outcomes of a student. In addition, the proposed methodology aids both pre-service and in-service teachers to enhance academic and career excellence of a student.

Key words: *Engineering domain, NEP, Outcomes, Teaching-Learning methodology, Test*

I. INTRODUCTION

The conventional methodology of teaching-learning process is more of teacher centric. In this process the involvement of student is found to be passive. Such methodology is creating a wide gap between industry and academia, hence leading to unemployment or production of unskilled labor in INDIA. To overcome this major gap in teacher centric methodology, NEP-2020 has introduced student centric methodology in teaching-learning process (Aithal, P. S., & Aithal, S, 2020). The new methodology can be implemented by practicing innovative teaching methodologies in Engineering stream. This makes student from employment seeker to employment provider, and this will help to achieve “make in INDIA” objectives also.

From literature (Rose, G et al., 2015; Felder, R. M, and Brent R,1996; Aithal P. S and Aithal, S 2020), we can find the following problems connected with the engineering students related to teaching-learning process (Desai, et al., 2015). The students find it difficult in understanding or learning the particular engineering subject to the adequate level. Mainly due to:

- 1) Lack of practice on prerequisites of particular subject.
- 2) Lack of fundamental knowledge in their lower standards.
- 3) Lack of motivation [or] interest in particular subject.
- 4) Lack of innovative thinking about particular subject.
- 5) Lack of futuristic prospects/applications/employability about particular subject i.e., after learning a particular subject where and how it can be utilized from career perspective.

The above-mentioned problems inhibit student’s conceptual growth, and also his/her grades.

To address this issue, a new methodology is presented in this paper. The methodology is developed in line with NEP-2020 objectives (Khatak, S 2022; Mehta, S, 2021). This is to adopt student-centric teaching-learning process as mentioned by (Kumar A,2021).

A. Paper Organization

This paper is organized in five sections, viz (i) Importance of NEP goals and bottlenecks in Teaching-Learning (T-L) process in engineering domain, (ii) the reasons for framing objective of proposed TSOE methodology,

(iii) stages involved in TSOE, (iv) Effectiveness and implications of TSOE methodology, and (v) Concluding remarks and future work.

II. OBJECTIVE OF PROPOSED METHODOLOGY

The main objective of this work is to improve academic performance of the student by imparting conceptual learning and practice career-oriented skills to enhance leadership qualities of a student. The objective of proposed TSOE methodology is framed to achieve the above mentioned NEP goals through the following questionnaire.

- How a teacher can teach concepts effectively?
- How to enhance absorption rate of student?
- How to attract students towards a problematic subject?
- How student can achieve academic excellence in concerned subject?
- How students can improve their communication skills?
- How to make student industry ready?
- How to inculcate entrepreneur skills among students with Teaching-Learning process?

III. METHODOLOGY

In this paper, we introduce a new methodology called “Teacher-Student One entity” (TSOE), which, basically, means the teacher is integrated with the student and vice versa. The TSOE methodology involves various stages and is explained with the support of the following algorithm as shown in **Figure.1** to understand proposed methodology in an easy manner

A. Algorithm

Step1: Teacher has to prepare course content in advance for effective delivery.

Step2: Motivate students and get their attention for a particular subject to make class lively.

It is achieved with demonstration of the need of learning particular subject with real time examples.

This activity creates interest in learning the subject.

Step3: Revise the prerequisites if necessary.

Emphasis on fundamental concepts in brief, which are required to understand the subject in good manner

Step4: Conduct periodical tests (Felder R. M, 2002) to evaluate student’s absorption rate.

The following are the notable points, which are based our experience and knowledge gained in the academic domain, with regard to improving the performance: They are:

1. Conduct oral test in every class for Two-minutes to keep students active.
2. Conduct Two-minutes surprise tests in every week.
3. Request students to express covered topic in Two- minutes in their words.
4. Request to prepare poster on covered topic with real time application.
5. Motivate students to relate covered topic with day-in and day out activities
6. Request students to organize events/fun games on covered topic in Semester end
7. Conduct quiz after every Chapter/Unit
8. At the end, request to prepare One-page summary of overall subject.
9. Request student to implement projects based on acquired knowledge

The above-mentioned evolution patterns are interesting but consumes classroom time, to minimize time perform evolution test using ICT tools (Lawrence J E. and Tar U A, 2018).

Step5: If absorption rate (AR) is less than optimum then repeat **Step-3 and Step-4** to improve academic performance of the student.

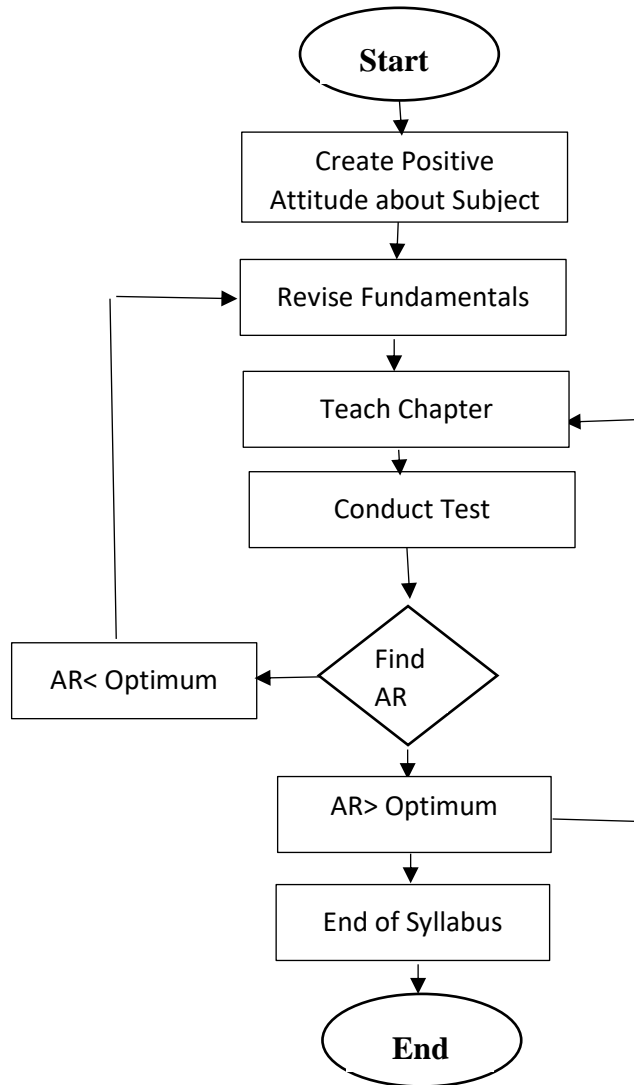


Figure 1: Flow chart for implementation of TSOE methodology

IV. RESULTS AND DISCUSSION

The performance evaluation of the proposed methodology, called TSOE, is carried out by validating the outcome of a specific U.G. subject namely “*Probability and Stochastic process (PTSP)*” as a test example. It is a II B.Tech (Bachelor of Technology) I semester subject for all Jawaharlal Nehru Technological University-Hyderabad (JNTUH), India. The selected class for this subject consists of 64 students, of which 36% are girl students and 64% are male students.

PTSP is a problem-oriented subject and thus the teacher has to create a positive and enthusiastic attitude among the students by demonstrating real time applications like weather forecasting, price prediction of financial stock market, development of model using machine learning applications, etc.,

In general, any problematic subject demands more practice and student has to remember basic formulae. For this, we conducted periodical tests of different types as listed in **Step-4** of TSOE methodology. After every test, AR is verified. The AR score decides the further steps to be implemented, as depicted in **Figure.1**.

To improve academic grades of an individual student, initially we analyzed the score of Test-1 and classified the students into three categories, viz: i) Quick learner category, ii) Slow learner and iii) Medium learner category. From this analysis, we observed the category-I students absorb the concepts fast and can reproduce it in the exam effortlessly. However, category-II needs more focus and more practice. These students require

special attention by subject teacher. If teacher identifies category-II type of students via **Step-4** in initial days then it would help to achieve better grades.

The Category-III student understands the concept but unable to reproduce in the end exam effectively. We observed this is due to lack of practice. If a teacher makes the students to remember for a longer duration through any means, then good academic score is possible. This can be achieved by conducting periodical tests (as discussed in **Step-4**) and frequent interactions with the students by asking the student to come and explain on the board. This would not only help the student but also ensures the teacher on the extent of reception of the subject by the student.

All the teachers expect a full absorption of the subject by the students through regular practices such as tutorials, assignments, elevated pitch (in which the students explain on the board) and seminars. To make him/her practice more, various tests in different patterns are conducted for good absorption and ease the load/stress on the student as every student is bound to read and practice problems in the name of exam. To avoid possible copying of assignments, most of these are done during the lecture hours. The cooperation of parents is also sought in some of the cases to eliminate irregularities of the students.

A. Measure of Effectiveness of TSOE methodology in terms of Student-Load

To measure the effectiveness of the TSOE methodology, we analyzed in terms of load (or stress) on the student vs syllabus covered, which is basically the extent of knowledge/concepts the student has to gain over a period of semester. It is obvious that, through the student is 'receptive' during the lecture, he will not be able to 'absorb' unless he practices at home. A class test at the end of each unit will compel him to study well and absorb; otherwise, he will find heavy at the end of semester. A graphical representation of syllabus covered and the consequent load accumulated is given **Figure.2**. As an example, the content accumulated at the end of unit-3 is 'x' which is basically the load on the student. When a test is conducted, the student is bound to read and absorb due to which the load drops down to a level 'y' as depicted by the downward arrow. Otherwise, the load accumulates to level 'z' (curve A) by the time of final examination and the student will not face the exam well. Curve D represents an ideal case when the teacher covers the syllabus uniformly over the time due to which the load is good and absorption level of student is well. When the coverage of syllabus is non-uniform as in curve B in which the teacher is in hurry at the final phase of the semester and leaves some content uncovered due to which even the merit student finds difficulty to cope up due to heavy load (curve C) and the absorption level falls resulting in lower scores.

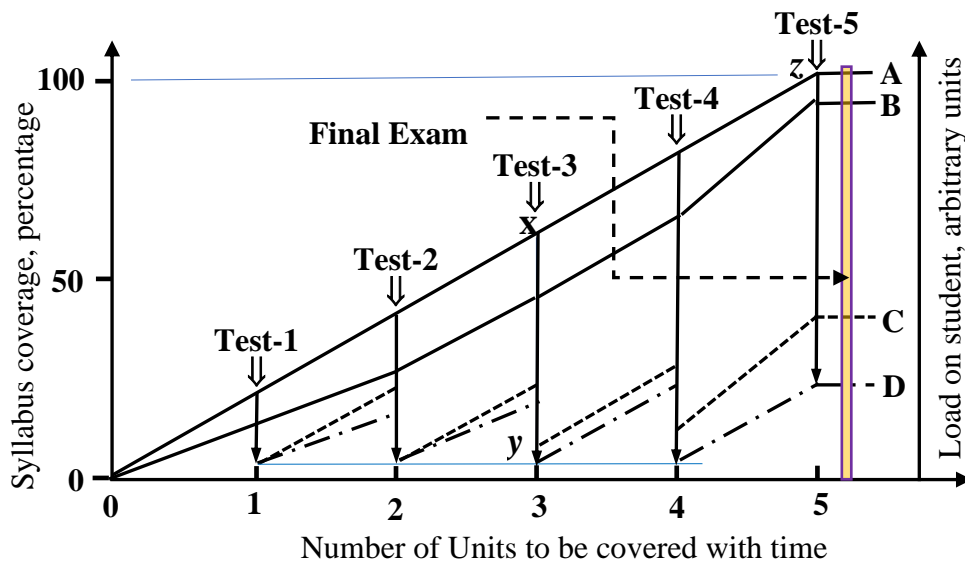


Figure. 2. Plots of syllabus covered and the consequent load on student as a function of time (expressed in units) during the semester. The solid ones (A) and (B) represent the percentage syllabus (cumulative) covered uniformly and non-uniformly, respectively. The dotted lines (C) and (D) represent the load on a student due to the syllabus covered uniformly and non-uniformly, respectively.

B. Achieve NEP Goals through TSOE methodology

Another objective of NEP-2020 is make students “industry ready” (Chaturvedi S, 2022). There are bottlenecks in achieving this goal which could be surmounted by adopting the following aids in Teaching-Learning (T-L) process:

- a. Technical Speech (TS):
- b. Technical Debate (TD):
- c. Technical Group Discussion (TGD):
- d. Technical Poster Presentation (TPP):

TS activity is organized by calling students randomly onto dais to speak on any covered topic for 1-minute. This activity helps student to improve public speaking skill.

Similarly, other activities TD, TGD, and TPP conducted by dividing the students into various groups and request them to present covered topic in their words. These activities will help to groom student into future leader (Entrepreneur).

Also, the above T-L techniques are adopted in *PTSP* subject delivery to increase receptiveness (AR) capacity of the student.

The effectiveness of the above activities TS, TD, TGD and TPP is assessed in terms of quality of presentation. The presentation quality depends on various factors including content quality and depiction quality. To measure the quality, we considered following parameters. They are:

- **Communication skills of student:** In this, student learn to maintain good body language and PPT or other presentation skills
- **Knowledge/Command over subject:** This skill makes student to do literature survey and latest happenings on content to be presented.
- **Time management:** This parameter helps to present content in stipulated time.
- **Number of creative ideas:** This parameter enables student for out of box thinking.
- **Criticism acceptance:** It teaches student to accept comments with positive attitude.
- **Audience reachability:** This parameter makes student to prepare content based on target audience.

Based on students’ performance in above activities, we advise every individual student to practice the skill in which student is lagging. Such practice gives an opportunity to student to groom better. Repeated corrections help student to enhance their leadership qualities. As a result of these activities, we can make students future entrepreneurs besides making students job ready.

In addition to the above (a)-(d), industrial visits to the students as well as the faculty are essential. A close interface with industry is essential to make the students “industry ready”. The faculty should work on industrial problems which would subsequently lead to consultancy thereby generating an external revenue to the college. In summary, TSOE methodology benefits both teacher and student to achieve conceptual absorption and career-oriented skill enhancement. A teacher can expect proper concept delivery with TSOE methodology and student can show good academic excellence as well. Another advantage is TSOE methodology helps to achieve major objective NEP-2020 is to shift “teacher centric learning process” to “student centric” by practice this sort of teaching methodology in Engineering stream (Aithal, P. S, and Aithal, S, 2020). This makes student to become employment provider than employment seeker.

V. CONCLUSION AND FUTURE WORK

In this paper, we presented a few bottlenecks in Teaching-Learning practices and an attempt is made to provide optimum solution with proposed TSOE methodology. The proposed TSOE methodology aids both student and teacher in Teaching-Learning process. TSOE methodology is illustrated in step-by-step manner for better understanding. TSOE implements TER rule till the end of semester (or academic year). We validated TSOE methodology for a problematic engineering subject-Probability Theory and Stochastic Processes. The Results demonstrates that proposed methodology benefits students to achieve well academic grades and also improve job required skills. In future work, our focus is to develop a mathematical model for better analysis of retention rate and absorption rate through advanced Teaching-Learning techniques to achieve NEP goals.

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