A Case Study: Innovative Teaching-Learning Practices towards OBE

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Abstract: Outcome-Based Education (OBE) is a new norm in the education sector. At our institute, we have implemented many new practices for the teaching-learning process. These practices ensure the active engagement of students during the COVID-19 pandemic situation. We introduce learning flexibility, Collaborative learning, and skill-based practices to achieve OBE. In this paper, we have shared our experience of innovative Teaching-Learning practices towards OBE. We hope that our case study will help fellow academicians and researchers to implement new teaching-learning practices.

Keywords: Outcome-based Education; innovative educational practices; digital transformation; Learner-centric approach; KSA.

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1. Introduction

Outcome-based education or OBE is a learner-centric educational model that aims to maximize student learning through attainment of desired outcomes. In the traditional education system, the emphasis was more on what contents should be taught so that better marks could be scored, whereas OBE is concerned with what KSA (knowledge, skills and abilities) students will be able to acquire to suit the actual requirements of their future workplaces [1,2]. There are four basic principles of OBE given as given by [1].

a) Clarity of focus

Teachers must be focused on what the students should know, understand and able to do.

b) Designing down

The definition of what is to be done should be designed down so that the student can easily grasp and commit what he has achieved by the end of the program. Once this has been done, all the related decisions are then made ensuring the desired end result to be achieved.

c) High expectations

Teachers must set high and challenging standards for the students so that they get encouraged and get engaged deeply in learning.

d) Expanded opportunities

Teachers must attempt to provide expanded opportunities for all students. Not all learners can learn in the same way and at the same instant.

The OBE model in engineering education focuses not merely on technical education of learners, but also on developing cognitive, psychomotor and effective domains, on acquiring 21st century skills, such as critical and creative thinking, communication and collaboration, decision making, problem solving, interpersonal relationship, emotions intelligence, and lifelong learning. Some of the characteristic features of OBE are that it is non-prescriptive, flexible, adaptable, competency-based, self-paced, supports asynchronous learning, and is supported by well-defined learning objectives towards achievement of intended outcomes.

There is a clear shift from education as a mere transmission of knowledge to education which builds learner competencies that would enable them to perform well in a rapidly changing global workplace [3].

The Washington Accord encourages and facilitates the mobility of engineering graduates and professionals at an international level. India is officially a member of the Washington Accord from 13 June 2014 with permanent signatory status of the National Board of Accreditation (NBA). In line with the Washington Accord and NBA, OBE involves designing of clearly-defined Program Outcomes and Course Outcomes, along with the Vision, Mission and PEO statements and Graduate Attributes. It focusses on outcomes of the program rather than the curriculum framed for the courses. OBE emphasizes on identifying what the learner should be able to do at the end of the program, assessing to what extent the intended outcomes are achieved, and building academic processes to facilitate learners to achieve the outcomes. India's National Education Policy 2020 (NEP), which envisions a learner-centric education system (the central premise of OBE), if implemented effectively, has the potential to transform India into a vibrant knowledge society [4].

This is a case study based on our institute's innovative teaching-learning practices in its journey towards OBE. This journey has been a gradual one, navigating within the framework of the guidelines prescribed by the affiliating university and other regulatory bodies. This case study particularly examines the initiatives undertaken as a result of the sudden shift to online mode of instruction owing to the onset of the Covid-19 pandemic. The rest of the paper is organized as follows. In

section one introduction of the OBE
frame work is presented. In section two, three and four, digital transformation, learner-centric approach, collaborative learning are discussed, respectively. Then, section five and six focuses on building KSA competencies and key observations, respectively. Finally, concluding remarks are given in section seven.

2. FROM DIGITALIZATION TO DIGITAL TRANSFORMATION

With the objective of continuous improvement, digital transformation has been a way of life on the campus, with a number of initiatives being undertaken over the years [5]. The process of digitalization of academic resources was initiated at the institute in 2014-15, wherein the traditional book-based learning material was converted into comprehensive digital version flipbooks (inclusive of history, quizzes, interactive games, videos, and links). These digital resources were specifically designed to engage the end-users - our millennial learners. These flipbooks were made accessible on the institute's academic networking forum and on our institute's digital repository.

The institute invested in Lecture Capture software [6] in 2015-16 which enabled faculty to record live lectures across all programs and all years which were made centrally available to students for revision and query-solving. Editing rights were given to faculty to highlight crisp points and supplement the recorded videos with further learning resources. This system offered flexibility to students to learn and revise core concepts at their own pace, in addition to attending classroom sessions. This had the added advantage of teachers conducting advanced lectures using flipped classroom methodology, as students could come prepared to class using resources available as our customized courseware. This facilitated collaborative teaching-learning practices involving various stakeholders such as teachers-students, students- students and teachers-teachers.

One of the steps towards digital transformation, was that the institute already had the licensed version of Microsoft Office 365 [7] and had authenticated credentials in place for all students, teaching, technical and administrative staff. This facilitated the smooth and secure conduct of online sessions through the meeting platform of MS Teams since the onset of the pandemic-induced academic sessions of 2020. All students and faculty received hands-on training on using the multiple features of MS Teams application. Student engagement during lectures and practical sessions has increased and this can be attributed to all students having equal opportunity to express their views as opposed to a linear and space-restricted seating arrangement in physical classrooms. The concept of divisions (Division A with 60 students, Division B with 60 students) is no more there in online sessions. All students of a class are together. Lesser hesitation among students has been observed while participating in class discussions as visual identity is not required. Students can get their queries resolved in the chat section also, if they feel conscious of voicing their queries.

LEARNER-CENTRIC APPROACH - FLEXIBILITY Using the analogy of a job interview, it is as important for a
candidate to choose the right organization to establish his/her career, as it is important for an organization to choose the right candidate. Similarly, keeping learner-centricity in mind, flexibility for learners and choice of teachers was introduced on an experimental basis (within the prescribed framework). Initially teachers were allocated classes (a practice which is arbitrary in a way); now more choice is offered to students to decide whom they wish to learn from. This involved not only learning at their own pace, it also opened up the possibilities of learning from the best faculty across various programs. This was implemented in two ways – a) breaking down silos for better access; b) choosing the right fit of teaching style, which are explained as below:

a) Breaking down silos:

Traditionally, in the confines of the classroom, the planning was more of Department-wise, and students only had access to faculty of their respective Departments, which in a way encouraged the formation of silos. However, now the focus is more on breaking established patterns; in the online mode, students can exercise the option of attending the sessions conducted by the faculty of their choice who hail from various Departments. For example, traditionally Applied Mathematics was only taught by core Maths faculty, but owing to this system, now a few faculty who hail from related Engineering domains also teach Maths, which could be a useful move considering the customization and mapping to future courses that the student will encounter while pursuing the program. In another case, sessions on Database Management taught by a particular faculty were only allotted to the students of the Department he was a part of. In this model, students across various programs can sign up for his sessions.

b) Choosing the right fit:

Every student has different ways of learning (visual, auditory, kinesthetic, etc.), as every teacher has a different way of teaching. Students may have different learning preferences with different teachers. In some universities abroad, whenever students sign up for classes in college, a given course may have up to 3-5 different professors to choose from. Therefore, it makes sense to research those professors to find out which ones are good, and whose teaching style suits them the most. The paradigm shift in this strategy is that earlier teachers used to be allotted students, now students are joining the classes taught by the teachers of their choice. The process followed for the model is as shown in figure 1 and follows:

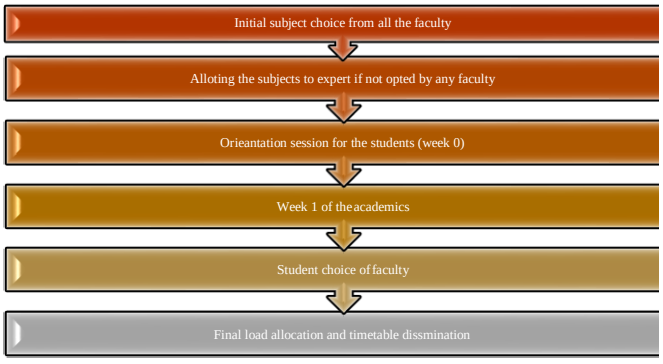
1. Choice of subjects was taken from all the faculty members without any restrictions of domain or department. A faculty could select as many subjects as he/she may like to offer from the curriculum prescribed for all the departments.
2. Subjects that weren't selected by any faculty were

listed and those subjects were assigned to experts.

These experts were either from within the institute or were visiting faculty members.

3. After the first draft of subject choice was created, each faculty, during Week 0, oriented the students regarding the subject they were offering; the orientation included the syllabus, teaching methodology which the teacher intended to follow, list of assignments, list of practical experiments and tutorials.
4. Week 1 was an open academic week where the students tried out different choice of the faculty by attending their lectures and practical session as per their wish.
5. After Week 1 final choice of student was consolidated; the students chose the faculty for each subject based on their experience of Week 0 and Week 1.
6. A new timetable according to the opted faculty was designed as shown in figure 2. A batch is discarded if it does not suffice the minimum required number of choices from the students.

Figure 1. Choosing the right fit of faculty



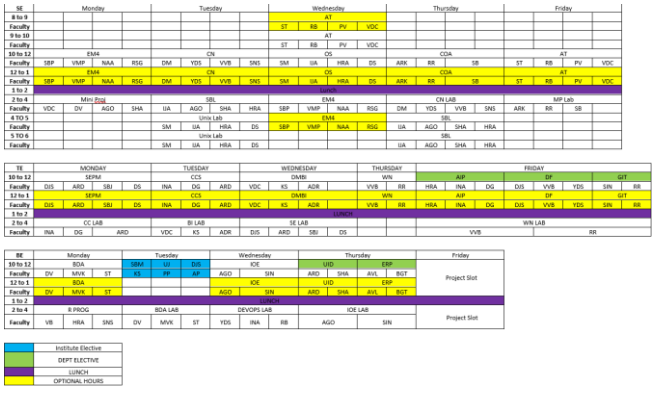


Figure 2. Sample Time-Table of choosing the right fit faculty

Of course, this strategy has its limitations; some teachers may have too many students opting for them and joining their sessions, a few teachers may have no academic load at all. This can be offset by offering supporting teachers to those who are handling many students. It has given an opportunity for the teachers to introspect and self-analysis on how to cope and equip themselves with the changing learning needs of millennial tech-savvy students.

3. CREATING MORE OPPORTUNITIES - COLLABORATIVE LEARNING

Practical learning is the soul of engineering education. With focus on experiential learning, in our institute, in a few cases, the boundaries between theory sessions and lab sessions were erased [8].

i) Learning by Doing Approach: In the course of Computer Programming taught to First Year Engineering students, theory lectures were also conducted in computer labs to give direct access to hand-on learning to students. This strategy proved to be a very successful one and was well-accepted by students. In the course of Engineering Chemistry, a professor showed live demonstrations using chemical apparatus and performed practical sessions live for students to view in online mode. Interactive quizzes, videos and games were prepared to strengthen concepts.

ii) Virtual labs and virtual experiments: Virtual Labs replaced physical labs in a few cases. Faculty designed virtual experiments and demonstration videos for students to learn by performing the experiments remotely. Virtual Tours were conducted in collaboration with the industry.

iii) Mapping of subjects to Open Source & MATLAB: The institute collaborated with Mathworks and signed up for a campus-wide license for MATLAB and Simulink. Subjects were mapped to Open Source and MATLAB for practical application of relevant technologies. (like Signal System, embed system, control system,etc). The plethora of courses offered on MATLAB has benefitted students and faculty alike who have undergone various certifications, free of cost to the end-user.

iv) Capstone Projects: Students have learnt some courses with the added benefit of capstone projects as a result of collaboration with Coursera and IBM. Some of the popular live projects were in the domains of Data Science, Internet of Things, Cloud Computing, and Database Management. (1000+ students completed many projects).

v) Solving real life problems through Hackathons: The institute organized competitive learning initiatives like a Hackathon by generating original problem statements from faculty members. Experts from the industry were invited to judge the innovative software solutions provided by the students. Students participated in many external hackathons organized by major software MNCs as well and have bagged prizes. (More than 300 problem statements were generated and more than 240 students and faculty members were as participants in the internal hackthon. Many Students won prizes at SIH)

vi) Problem Based Learning: Problem based learning and Project based Learning (PBL) was implemented across many courses. Real life problems were assigned to teams of students as mini projects and as BE Final Year Projects.

vii) Participative Activities: Blogging was encouraged and students posted their technical content, tweeted about

technology on Twitter, created/updated their LinkedIn profiles, created video resumes, and designed e-portfolios.

viii) Collaborative activities: Group assignments and collaborative activities were conducted with more ease, especially with features like Breakout Rooms in MS Teams.

ix) Student engagement technical activities: A wide variety of student engagement activities were conducted by student chapters of professional bodies like CSI, ACM, IEEE, IETE with a good balance between curricular and beyond curricular aspects. Technical resource persons from universities abroad and industry personnel were invited to share insights.

4. BUILDING KSA COMPETENCIES

In line with the requirements of the corporate world, the institute attempted to strike the right balance between Knowledge, Skills, and Abilities (KSA) competencies. While knowledge focuses on the theoretical understanding of concepts, skills are the practical application of theoretical knowledge, and abilities are the in-built traits that a person possesses.

A common maxim says never let a crisis go waste. The unanticipated lockdown situation necessitated immediate crisis management strategies, not just in the health and economic sectors, but also in the education sector. There was a scramble towards online mode of teaching. To add to this thought, it is said that "necessity is the mother of invention" and a host of new ideas were brainstormed and implemented to equip our students with a new set of skills that the new situation had necessitated.

i) MOOC Certifications: As a result of the institute's collaboration with prestigious MOOC providers like Coursera, IBM and edX, students and faculty completed certificate courses and projects in any domain of their choice, that too completely free of cost to the end-user. This threw open the

possibility of exploring various new technologies and domains and added value to the learning process, see table 1.

Value Added Courses: Online academic sessions were planned in such a way that there is sufficient time for students to pursue various value added courses, which were open to students across all branches. As many as 32 Value Added Courses were offered to students across a variety of domains. All sessions were recorded and the sessions were made available to the students so that they could revisit the lectures at their own pace, in case of technical disruptions at their end. In spite of recorded lectures being available, the attendance of students in live online lectures indicated an improvement. The feedback from students indicated that they had accepted online learning very positively. (Data Analytics, AI/ML, Block Chain, Python, etc., were very popular courses among all the offered courses.)

iii) Interactive Webinars: A series of thought-provoking interactive webinars was initiated. People from across various walks of life and hailing from various industries were invited to deliberate upon their experiences. This diverse platter of topics exposed students and faculty to actual implementation of modern technology solutions (e.g. data analytics and database management in various companies).

iv) Extra-curricular activities: Additionally, with a view to develop holistic personality of students, webinars were also held on non-technical topics such as classical art forms, culture and heritage, innovative farming techniques, indigenous textiles, stress management, career counseling etc. All these events attracted a good number of students and faculty even though they were completely voluntary.

Table 1: Indicators of New Initiatives

Sr.No	Indicator	No of Beneficiary
1	MOOC Certification	1800+ Students and Faculty
2	Value Added Courses	650+ Students
3	Webinars	2000+ Students and Faculty
4	Extra-Curricular	500+ students
5	Internships	1500+ Students
6	Attendance	Improved by 10% ~15%

5. KEY OBSERVATIONS AND LEARNINGS OF OBE INITIATIVES

The efficacy of the institute's OBE initiatives cannot be accurately measured immediately as it is a continuous process. However, there are some indications about how these initiatives are being received by our students. The following are some of the key observations following the OBE initiatives implemented:

i. During the pandemic, student engagement activities increased by approximately 50%. The reach is much better now, owing to the events being conducted on digital platforms. This was evident from Insights reports captured on MS Teams.

ii. Overall attendance of students has gone up from an average of 70-75% to an average of 80-85%, which indicates that online teaching is well received by students.

iii. Improved attendance in Internal Assessment Tests.

iv. Improved performance in End Semester Examinations conducted by the affiliating University.

v. Student Internships in the virtual mode as compared to offline mode have seen an exponential rise of 300% compared to last year., see table 1.

vi. Faculty training is happening at an improved pace. Faculty underwent training for online teaching by attending Faculty Development Programs on contemporary topics like Design Thinking and Web Tools for Online Pedagogy. They attended a host of webinars by industry experts. On an average, every faculty member has completed 3 MOOC certificate courses on Coursera and edX.

vii. Assessment of student performance is more automated, more accurate and saves time of faculty.

6. CONCLUSION & THE OBE ROAD AHEAD

The above-mentioned initiatives are an opportunity for

all to reinvent our teaching styles to suit the modern day requirements of millennial learners. Some need to unlearn the age old traditions of conventional teaching which were perhaps successful in an earlier era, but are not relevant now. Focused training and more outcome-based learning efforts are required for true digital transformation. We intend that these new ventures go hand in hand within the stipulated framework of the academic regulatory bodies. Accordingly, meeting the requirements of the usual accreditation processes will progress as mandated. However, these small new initiatives help to break the complacency which results from established patterns, and brings in a fresh breath of change, which is so necessary for revitalizing the academic processes.

We still have a long way to go ahead, but our institute has taken some unconventional steps in the pursuit of achieving OBE and this was done keeping the best interests of the students in mind.

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