Faculty Attitudes Toward Implementing Innovative Teaching and Learning Approaches in Engineering Education: A Study on Exposure to Outcome-Based Education (OBE)

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Abstract: Because of the rapid improvements in engineering education, creative teaching and learning strategies are required in order to elevate the level of student involvement and the outcomes of their education. The concept known as Outcome-Based Education (OBE) has evolved as a transformational approach that changes the focus away from the conventional delivery of information and towards the quantifiable capabilities of students. In this study, faculty members' perspectives on the implementation of OBE in engineering education are investigated, with a particular focus on their exposure, views, and the difficulties they face while adopting this method. The methodology utilised was a survey-based approach, and responses were collected from engineering faculty members working at a variety of universities. With some faculty members noting the benefits of OBE in boosting student learning and employability, the data indicate a mixed welcome. On the other hand, some faculty members note problems such as increased workload, lack of institutional support, and reluctance to change. The research highlights the importance of implementing targeted training, administrative encouragement, and regulatory reforms in order to promote the smooth integration of OBE into engineering courses. Insights such as these add to the continuing discussion regarding the enhancement of engineering education via the implementation of pedagogical innovations that are both organised and outcome-driven.

Keywords: Engineering Education, Outcome-Based Education, Faculty Attitudes, Innovative Teaching, Pedagogical Reforms

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INTRODUCTION

It is essential for students to have an education in engineering in order to be adequately prepared for the continually changing requirements of both the industry and society. There has been a growing need for a more organised and competency-driven educational framework, which has significantly posed a challenge to traditional teaching methods, which are frequently centred around the delivery of content and the memorisation of repetition. An technique that has evolved as a revolutionary method is known as outcome-based education (OBE). This method places an emphasis on quantifiable learning outcomes, the development of skills, and the overall growth of students. Occupational Behaviour Education (OBE) guarantees that graduates gain the information, skills, and attitudes necessary for professional success by concentrating on learning goals that have been set. In spite of the fact that it has the potential to be beneficial, the adoption of OBE in engineering education has been met with a number of obstacles, notably with the perspectives and preparedness of faculty members concerned. When it comes to the successful implementation of new teaching methodologies, faculty members play a critical role, and their views towards online learning environments (OBE) can have a considerable impact on how effective they are. While there are educators who acknowledge the benefits of online learning environments (OBE) in terms of increasing student engagement and employability, there are also educators who are concerned about the increased workload, the complexity of assessment, and the requirement for ongoing curriculum

modifications. It is the purpose of this study to investigate the attitudes of faculty members towards the implementation of OBE in engineering education by analysing their degrees of exposure, perceived advantages, and the difficulties encountered in its implementation. It is the purpose of this research to identify critical elements that influence the acceptability of OBE and to make ideas for strengthening its incorporation into engineering courses. This will be accomplished by analysing the opinions of faculty members. Both the continuing discussion on educational reforms and the requirement for faculty support structures to guarantee a seamless transition towards outcome-based learning will benefit from the findings, which will add to the ongoing conversation.

OBJECTIVES

1. The Considering faculty members' perspectives on the use of novel teaching and learning techniques and processes in engineering education, as well as their exposure to OBE

2. The Identify the barriers that are impeding engineering education from implementing an OBE in the classroom with regard to teaching and learning.

LITERATURE REVIEW

A significant amount of research has been conducted on the implementation of Outcome-Based Education (OBE) in engineering education, with a particular emphasis on the usefulness of this approach in enhancing learning outcomes and aligning curriculum with the requirements of the industry. Objective-based education (OBE) places an emphasis on a student-centered approach, in which learning objectives are clearly specified and assessments are structured to quantify the accomplishment of competency. There are a number of studies that emphasise the advantages of online learning environments (OBE), which include greater employability, enhanced critical thinking abilities, and a more organised learning process. However, there have been reports of difficulties in putting OBE into practice, particularly with relation to the attitudes of faculty members and the preparedness of the institution. As a result of increased administrative effort, inadequate training, and the requirement for constant curriculum revisions, research indicates that faculty opposition is frequently the result of these types of factors. Furthermore, a number of studies highlight to the existence of institutional obstacles, such as restricted resources and restrictive assessment procedures, which impede the implementation of OBE in a smooth manner. The purpose of this study is to contextualise these findings within the framework of engineering education by investigating the interaction between the attitudes of faculty members, the support of the institution, and the efficacy of educational practices.

According to Dr. Maniam Kaliannan (2013), It is absolutely necessary for management to continually advocate and support the execution of OBE policies and procedures in order to achieve the goals that have been established. It is only possible to accomplish the objectives of the OBE if all of the stakeholders, including students, professors, administrators, and decision-makers at the institution, work together and cooperate.

Smith, S.,& Mukhopadhyay, S. (2010) The objective-based education (OBE) curriculum understands that advanced trainees' clinical practice is a balanced blend of all three knowledge, skills, and attitudes. This is in contrast to the objective-based curriculum, which treats knowledge, skills, and attitudes as independent components. In terms of benefits, this is the most important advantage that OBE offers.

Harden, Rodney M. (2007) It was discovered that in order for an OBE idea to be implemented, teachers absolutely need to base their judgements about the curriculum on the learning goals that have been

specified. If the OBE concept has not been effectively implemented, it may be because there is a lack of a competent staff development program, the staff is unable to recognise the value in OBE, and there is a lack of clarity regarding how to implement the approach at their institution.

Schalkwyk, G. J. (2015) It was discovered that in order to successfully use OBCTL in an Asian higher education environment, preparatory, in-class, and extracurricular activities need to integrate supporting components for both individual and group work. It is also necessary to make changes once the design has been completed. Teachers can improve their chances of achieving their goals of excellence in the classroom by routinely reflecting on their own performance and making modifications as required.

Laguador, J. M., &Dotong, C. I. (2014) It was revealed that academics may possess the appropriate information on the implementation of OBE, but they do not really carry it out. It is strongly recommended that faculty members take part in continuing training and seminars in order to ensure that they are up to speed on the OBE process. In the event that faculty members has a high level of knowledge and competence on how to carry out the OBE, there is a greater likelihood that the aims of the OBE will be accomplished via practice. An investigation conducted by Christopher Deneena (2013) revealed that students were unable to discern between OBE and regular teaching methods due to the fact that the concept of OBE was not clearly discussed with them.

According to Martin et al. (1998), The OBE methodology has a number of advantages, one of which is that it provides a practical method for implementing the OBE idea in a classroom environment. It is possible for teachers to select the appropriate metrics for their classes and to utilise the results of their students as feedback to improve their teachings. The findings of their investigation indicate that it is most effective to make use of many outcomes or to make use of several measurements of each outcome.

According to Margery H. Davis1 et al.(2007), Four different responses are available in response to OBE: There are four categories of individuals in our world: those who make a concerted effort to include organization-based education (OBE) into their curriculum, those whose efforts are unsuccessful, those who recognise and demonstrate outcomes, and those who have entirely discarded the concept of OBE. Having appropriate time for preparation, having competent leadership, having sufficient financial resources, and being receptive to criticism are all things that they feel are essential for effectively adopting OBE.

Research by Eugene et al. (2002) the outcome-based medical education model differentiated itself from earlier models that just specified clinical rotations without specifying the specific information, talents, and attitudes that were required for the highest level of success. Through the outcomes movement, there are new challenges to conquer as well as significant potential for advancement that have been provided.

RESEARCH METHODOLOGY

A field's methodology is its approach to theoretically methodically analyzing research methodologies. Theoretical examination of a field's guiding concepts & methodologies is what it entails. Finding out more about a certain issue is what the term "research" refers to. Research, then, is the practice of methodical inquiry.

Research Design

A research design is a detailed plan for the study or investigation. As a matter of fact, it serves as a blueprint for the methodical processes involved in hypothesis testing data interpretation (Singh, 2009). It is common to describe good design with adjectives such as adaptive, appropriate, efficient, & economical. A

good design, in general, reduces the possibility of bias makes the collected data more reliable. Finding a design with the lowest experimental error is the gold standard. The optimal most efficient research paradigm takes into account a wide range of factors related to a topic provides the most relevant data. Consequently, the study topic's purpose, hypothesis, objectives, in addition to the nature of the problem to be studied, are interconnected with the question of great design.

The research strategy utilized in the analysis was a hybrid of descriptive&quasi-experimental methods. According to Kothari (2011), descriptive research methods focus on describing the characteristics of the variables under investigation. Researchers using this approach ask "what" questions about their subjects instead of "why." Rather than asking "why," descriptive research aims to simply describe the demographics being studied. Descriptive research is quantitative in nature since data collection for statistical analysis is its primary aim. Researchers can collect data describe its demographics utilising statistical analysis utilising descriptive research, which is a valuable study strategy. Kothari (2011) states that it fits the bill of a quantitative research method. A quasi-experimental design, like a conventional experiment, seeks to ascertain the existence of a relationship between two variables (Campenon, 2016). A quasi-experiment is different from a real experiment since it does not employ random assignment. Rather, the subjects are grouped based on variables that are not decided by chance. Whenever real trials are impractical or morally problematic, quasi-experimental design can be a lifesaver.

Study Design For Population Sampling

Participants who meet the study's essential inclusion exclusion criteria will make up the population. Students enrolled in a computer science engineering degree program at a Bhopal engineering school & faculty members employed by engineering schools in LNCT make up the study's population.

Choosing research subjects that are statistically representative of the target community is an important aspect of sampling strategy. The research team will employ a non-probability purposive sampling strategy. Only 200 eligible faculty members will be comprised in the analysis, out of a total of 400.

Methods For Collecting Data

Applying closed-ended questionnaires, data will be collected from engineering faculty members at various educational institutions. After gaining approval from the relevant institutions where the faculty members are employed, the researcher will administer the survey. Regional engineering schools associated with LNCT University in the Bhopal area.

Survey Instrument Design

The researchers in this study surveyed engineering school professors using a closed-ended, standardised questionnaire. Findings from the literature study & research aims informed the development of the questionnaire. Employing a specially designed questionnaire, we asked the faculty members to score the five following aspects of the study:

- Attitude towards incorporating new approaches techniques into the T/L process,

- Familiarity with exposure to OBE

- How well OBE works in the T/L process;

- Whether or not people are willing to use OBE;&

· What kinds of problems arise when trying to implement OBE in engineering schools.

· Moreover, for the purpose of evaluating the course's impact on students' knowledge acquisition, a distinct survey with multiple-choice questions was created (50 in all).

The following is the outline of the survey:

· Fourteen items pertaining to engineering education's familiarity with preparation for outcome-based education (OBE).

· Attitude Towards the Use of Contemporary Approaches to Engineering Education ("Attitude" measures thirteen different aspects).

· In engineering education, the perceived effectiveness of using OBE in the teaching learning process (15 items).

· Openness to Using OBE in Engineering Education (perceived willingness to do so) (10 items).

· Ten items pertaining to challenges roadblocks to using OBE in engineering education.

· A test measuring the results of the Java programming course (50 questions).

SCALING TECHNIQUE

To determine how much people agreed or disagreed with each topic, we used the 5-point Likert Scaling Technique. There is a continuum from "strongly disagree" to "strongly agree" on the scale. Here is a tabular representation of the Likert Scale. It is easy to generate reports, outcomes, charts,& other visual representations of quantitative data when using a Likert scale.

Table 1 Scaling Technique

Dimension	Value
Strongly Agree	5
Agree	4
Neither Agree nor Disagree	3
Disagree	2
Strongly Disagree	1

VALIDITY

Any method of data collection relies on validity. In order to determine if the questionnaire was valid, content validity was employed in this study. For a test to be legitimate, its reliability in measuring the target variable must be high. What we mean by "content validity" is whether or not the items in the questionnaire actually measure the things it says it does. This is a measure of the inherent validity of the questionnaire's design. The validity of the questionnaire was tested by a committee of expert members. Five professors

with extensive expertise in OBE/CDIO were given the survey to complete. The average of each thing was determined by the ratings given by the experts. If an item's mean value was lower than 3, it was adjusted returned to the expert for further ranking. Items were considered for the survey if their mean value was three or greater.

The questionnaire that was created to test students' grasp of "Java Programming" in an OBE setting was validated & reviewed by experts to ensure its validity. The validity of the 50-question Java programming multiple-choice questionnaire was confirmed by assembling a panel of three experts to provide their opinions. Every effort was made to guarantee that each of the fifty questions addresses every aspect of the learning process.

RELIABILITY

Reliability was measured using the test-retest method. To start, thirty professors were given one of five sets of surveys. Each set had different questions, such as:

· How Well Do You Know OBE in Engineering Education? (14 items).

· Attitude Towards the Use of Contemporary Approaches to Engineering Education ("Attitude" measures thirteen different aspects).

· In engineering education, the perceived effectiveness of using OBE in the teaching & learning process (15 items).

· Openness to Using OBE in Engineering Education (perceived willingness to do so) (10 items).

· Ten items pertaining to challenges roadblocks to using OBE in engineering education.

After collecting the responses, the score was documented. Two weeks later, the identical surveys were administered to the identical thirty professors once more, their replies were collected evaluated. The excellent results of the Spearman rank correlation were 0.802.

DATA ANALYSIS & DISCUSSION

According to this study, a new paradigm has emerged in research on OBE in engineering education in India. Additional study in this area might focus on the following areas because of the vast potential for future studies: The study assessed faculty members' exposure, attitude, & awareness. Therefore, it may be worthwhile to undertake future studies with students to assess their perspectives on OBE within the framework of their education. The effect of OBE on education could also be the subject of its own research. The research was able to grow to include more ground across the nation, future research may compare the perspectives of teachers & students on the use of OBE in the classroom.

Demographic profile

This part presents the study's findings regarding the demographics of the faculty respondents. The gender, marital status, age, years of experience, & education level of the participants were all factors that researchers considered.
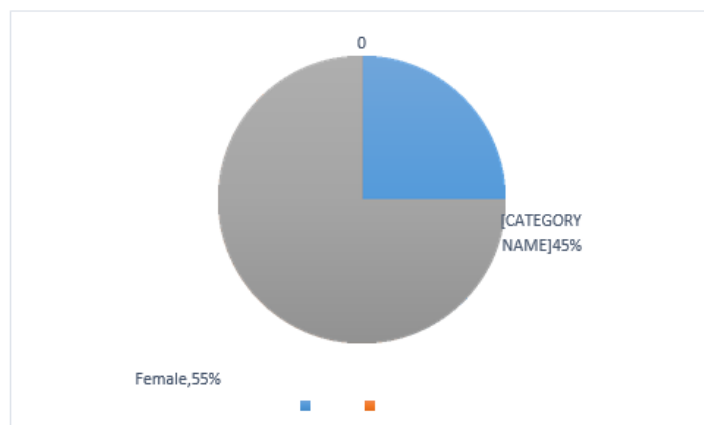
Gender

An analysis of the gender distribution among the participating professors is presented in Table 2. The data showed that there were 110 faculty members, or 55 percent female. Out of a total of 90 faculty members,

only 45 were male.

Table 2: Gender

Gender	No. of respondents	Percent
Male	90	45%
Female	110	55%
Total	200	100.0

Figure 1: Gender

Marital Status

The study's faculty respondents' marital status was analyzed in Table 3,whichrevealedthat 51% (N=102) were married&49% (N=98) were single.

Table 3: Marital Status

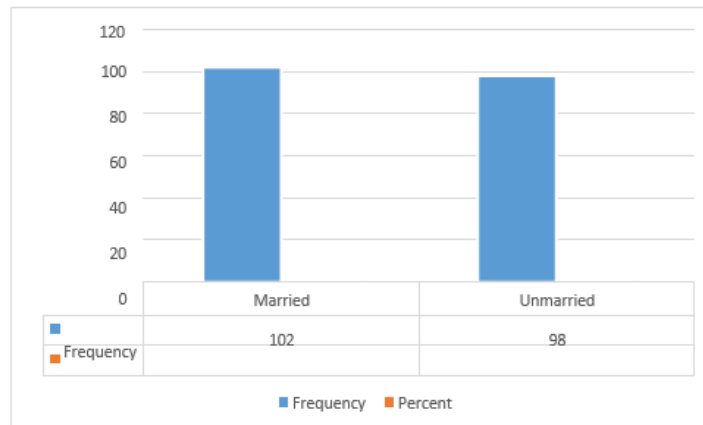| Marital Status	No. of respondents	Percent
Married	102	51%
Unmarried	98	49%
Total	200	100.00

Figure 2: Marital Status

Age Profile

The outcomes of the investigation of the age profile of the faculty survey takers are shown in Table 4. A significant fraction of the participants (27.5%, N=55) were found to be 50&older, due to the statistics. Of the total respondents, 17.5% (N=35) were in the 40– 50 age bracket, while 16% (N=32) were in the 35–40 age bracket. Among those who responded, 14% (N=28) were in the 25–30 age bracket. Only ten percent of responders, or twenty people, were in the twenty-five to thirty-year-old age category.

Table 4: Age of the Respondents

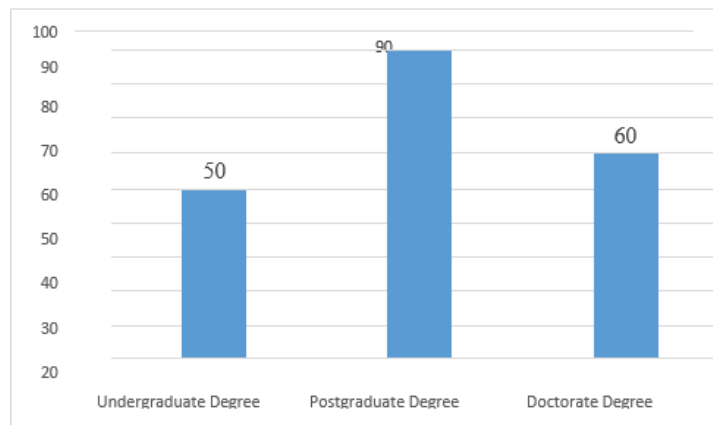| Age	No. of respondents	Percent
20-25	20	10%
25-30	28	14%
30-35	30	15%
35-40	32	16%
40-50	35	17.5%
Above50	55	27.5%
Total	200	100%
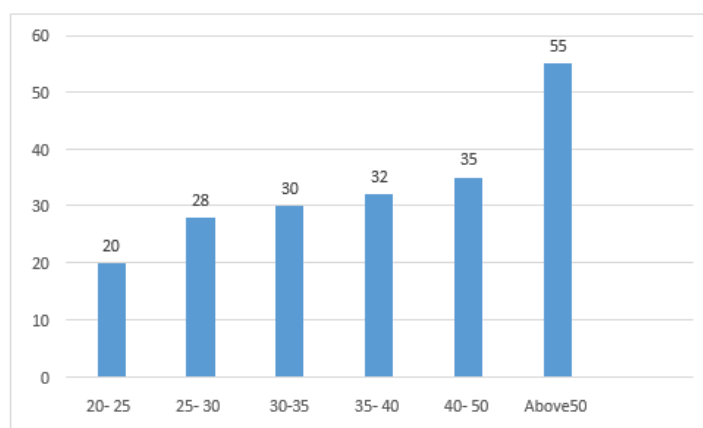
Figure 3: Age of the Respondents

Education

The study looked at the level of education of the professors who participated. The bulk of the respondents (45%, N=90) hold a postgraduate degree, as shown in Table 5. Fifty-five percent of responders had an undergraduate degree, & sixty percent have a doctorate.

Table 5: Education

Education	No. of respondents	Percent
Undergraduate Degree	50	25%
Postgraduate Degree	90	45%
Doctorate Degree	60	30%
Total	200	100.00

Figure 4 Education

Experience

The survey discovered that 45 percent of respondents (N=90) have professional experience greater than 10 years, as shown in Table 6. Among those who took the survey, 29% (N=58)had5–10 yearsofexperience,whereas16%(N=32)have2–5 years. Of the faculty members who took the survey, just 10% (N=20) had less than two years of experience.

Table 6: Teaching Experience

Teaching Experience	No. of respondents	Percent
Below2years	20	10%

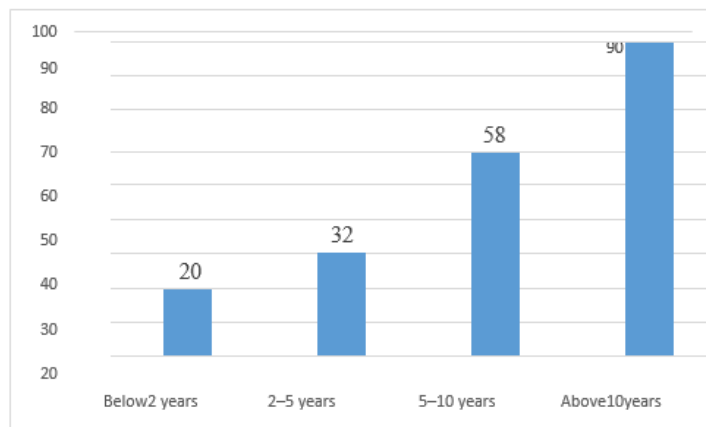| 2– 5years	32	16%
5– 10years	58	29%
Above10years	90	45%
Total	200	100.00

Figure 5 Teaching Experience

OBE Training

The research gathered information about the participants' background knowledge & exposure to OBE training programs, whether at their school or elsewhere. Curiously, out of the total number of responders (N=80), only 40% have actually taken part in OBE training programs. However, sixty percent of the teachers (N=120) had never taken a course on using OBE in the classroom.

Table 7: OBET raining

OBE Training	No. of respondents	Percent
Yes	80	40%
No	120	60%
Total	200	100.00
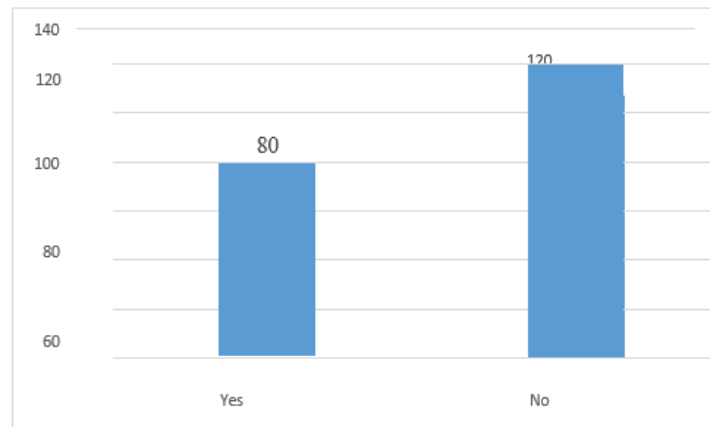
Figure 6: OBET raining

CONCLUSION

This study stands out because it examines OBE in engineering education, which is not commonly done in India. What is known about OBE's usage in engineering programs in India has been enhanced by this study. The following characteristics of OBE adoption were examined in this study: attitude, awareness, applicability, exposure, readiness to practise, and impediments. It also accomplished the use of OBE in a Java programming course. For kids to fully benefit from OBE and CDIO, instructors must get high-quality training and be exposed to OBE ideas and approaches, according to the findings. It is imperative that educators have both theoretical and practical training in OBE. College engineering teachers are grossly misinformed and unprepared when it comes to implementing OBE in their classrooms. Generally speaking, engineering professors seem to be receptive to incorporating innovative pedagogical strategies into their classrooms. Since the engineering faculty believes that OBE will enhance the students' learning experience, they are eager about incorporating it into their lessons. Faculty members are facing increasing challenges as they consider the potential ramifications and apply OBE to the teaching and learning process. A quasi-experimental study found that implementing OBE into a Java programming lesson increased both the teachers' and students' real knowledge retention. In order for OBE to be successful, everyone involved from instructors to school officials to students and their parents must pitch in.

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