Sustainable Experiential Learning: An Effective Tool for Enhancing Student's Competency and Employability

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Abstract—**Evolving topics of engineering demand innovative teaching practices. Experiential learning is the method of learning things through experience. Many core concepts in Instrumentation Engineering are obscure and hence difficult to comprehend for students. So experiential learning through industrial visits really comes as an effective tool. The paper presents experiential learning technique through industrial visits. For this, milk processing topic was taught in the class following the conventional method. Then a group of students was asked to visit a Dairy plant to understand the operations carried out in a milk processing industry. A feedback questionnaire was prepared based on the course outcomes. The students provided better ratings in the surveys conducted. The detailed statistical analysis was carried out by applying t-test. It was observed that the students' logical thinking and analyzing ability improved remarkably. Feedback from employers' survey indicated students' industry readiness. Improvement in the students' employability is also observed. The sustainable mathematical model created out of this framework suggests sustainability factor of 1.08 indicating effectiveness of the model over time.**

Keywords—**Experiential learning; Feedback analysis; Improved students' performance; Industrial visit, Sustainable model.**

***ICTIEE* Track*:* Pedagogy of teaching Learning**

ICTIEE Sub-Track: Engineering Teachers' Pedagogical Credentials

I. INTRODUCTION

ENGINEERING topics are evolving to be more complex and interdisciplinary. With the current expectations that the graduates should be industry ready, innovative pedagogy should be adopted. The majority of teaching methods follow lectures, tutorials and reference material to teach the course concepts. The concepts covered are often basic and theoretical wherein the students learn through memorization and recitation. By following these methods, the critical and analytical thinking, logic and problem-solving ability of students are not developed.

Experiential learning focuses on the idea that the best way to learn things is by having experiences. The things that are learnt through experience are more effective and remain with us lifelong. Experiential learning includes various activities like industry visits, role play, video-based learning, and group discussions etc. Hall et al. (2002) states that teachers should motivate the students to learn concepts by doing practical work. Akella. (2010) states that industrial visits open the opportunities for students to acquire more knowledge of working methods and actual processes practically. It gives them exposure to current industry practices as compared to the theoretical knowledge learned in the classroom.

The present work focuses on the use of experiential learning for improving the students' knowledge and understanding, thereby enhancing their performance. Many core courses in Instrumentation Engineering are obscure and it is difficult to comprehend. Process Instrumentation and Control is a core course offered at final year level to Instrumentation Engineering students. This course includes the instrumentation involved and control required for various industrial processes like refinery, boilers, milk processing etc. For such topics the students were asked to visit actual plants and develop the control loops required. The feedback based on the course outcomes was collected. The detailed statistical analysis was carried out and it was observed that the students' performance has remarkably improved.

II. LITERATURE REVIEW

Going beyond the conventional classroom training is the need of the hour. At present, many universities and college faculties have adopted innovative teaching learning methods. These methods include various experiential learning, active learning; project-based learning etc. They can be effectively used for the execution of a typical course, considering the course contents and its nature. Experiential learning through industrial visits has a great impact on engineering students to improve their understanding and analytical thinking ability.

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Hence, the literature survey is carried out related to importance of industrial visits in engineering education, recent trends or practices followed in education systems, active learning and assessment methods in STEM field. The impact of these methods for overall improvement of students is studied in detail.

The need for innovative pedagogy, quality and professionalism in education systems is presented by Ratnalikar (1999) in his article. The article highlights the importance of various innovative methods in the teaching process. In a research paper by Prabhavalikar and Patil (2022) the authors have presented the implementation of active learning methods in modern pedagogy. The active learning tools like flipped class, puzzles have improved students' learning and understanding. The technique of video-based learning and its impact are presented by authors T.S. Desai et. al.(2022). This paper also highlights the enhancement in students' knowledge and understanding by active learning methods. The authors Upadhye et. al.(2022) experimented on project based learning pedagogy and presented the effectiveness and challenges of it. The authors Kulkarni and Ramdasi (2022) found Project-Based Learning Technique as an effective teaching tool for Holistic Development of Students. Hall et al.(2002) have presented the use of active learning methods in theoretical engineering subjects. Methods like group discussions and demo-based learning were implemented. It reflects the good effect of innovative methods to ensure success. The authors Abdulkareem sh. et. al (2013) have reported the importance of industrial visits and an attempt to make industrial visits an integral part of engineering education. They have observed good response and retention of knowledge from students' feedback. An article by Kanti Sen (2013) focuses on the importance of industrial visits in engineering education. The article presents the overall improvement in students' understanding and attainment after plant visits. The authors Nordin et.al (2012) have studied the importance of industry expert sessions and visits. They have commented on remarkable improvement in students' technical knowledge, lifelong learning and soft skills. The author Gavillet (2018) from University of Texas, Austin has presented types of Experiential Learning Opportunities available to college students. One such opportunity is Internship which offers students work experience in a chosen industry. Internships have a strong impact on student experiences in the workforce and community. In a research paper by DeGiacomo (2002), the benefits of experiential learning to employers are emphasized. The author Mamatha (2021) presents the benefits of experiential learning to students', institute and community. According to her emerging research indicates that the use of experiential learning in higher education institutions remains limited. The literature survey reveals that innovative methods are needed to improve students' conceptual understanding. It also emphasizes the importance of industrial visits in the engineering field which helps in bringing up students' analytical thinking ability. Various opportunities and benefits of experiential learning are presented. However, most of the references are review based and factual data is not found. Considering this, the paper presents practical implementation of experiential learning along with its impact.

III. METHODOLOGY

Instrumentation Engineering is the multidisciplinary branch that caters to the needs of various process industries like petroleum refinery, milk processing, water treatment plant and many more. These processes include the operations like material handling, transportation, separation, evaporation, heat exchange and similar multiple stages. It is a bit difficult for students to understand these processes thoroughly through conventional classroom teaching. One such core course Process Instrumentation and Control is offered to final year Instrumentation students. It contains comparison and selection of control strategies based on process characteristics. It also includes analysis and development of control strategies for given applications. The course outcomes are defined based on the understanding, analysis, design, and development of control strategies required in the process industries like milk processing, steel plant, cement plants and similar more industries. Considering the expected outcomes, experiential Learning is more suitable for this course. Through hands-on experience, students grasp the concepts in a better way and can correlate it with real-life applications.

For implementation of this technique, Kolb's experiential learning cycle concept was followed. The Kolb's hypothesis divides the learning process into the following four stages as shown in Fig. 1.

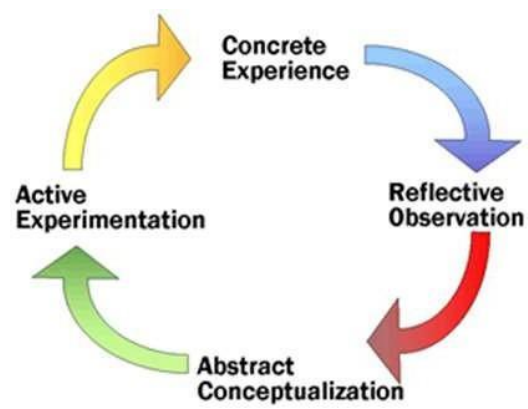

Fig. 1. Stages of Experiential Learning

a. Concrete Experience: In this stage, the student encounters a situation. This can be a totally new experience, or it may be an existing experience with a new thought.

b. Reflective Observation of the New Experience: In this stage the student reacts on the new experiences along with the existing experiences and tries to develop the correlation between them.

c. Abstract Conceptualization: This experience can come up with a new idea or a modification of an existing concept.

d. Active Experimentation: The newly learned or modified concepts will encourage the students to do experimentation. The student will apply these ideas to real life applications.

Experiential Learning can be executed in various ways namely flipped classroom, open ended assignment, internships, field visit etc. Field visit or Industrial visit is one of the effective ways to implement experiential learning. So, in this method was adopted for the selected course for better visualization and conceptual understanding.

The methodology adopted includes the following process steps

1. Identification of appropriate topic suitable for experiential learning: Milk processing topic was considered for this activity as this process can be better understood through field visit rather than studying theoretically.
2. Planning and Orientation: The various steps involved in experiential learning are planned and are briefed to the students.
3. Execution of the planned activities: The total class strength was divided into two groups. The milk processing topic was taught in the class to the first group following conventional teaching learning methods. The second group was asked to visit the actual industry of Katraj Dairy plant to observe study and understand the operations

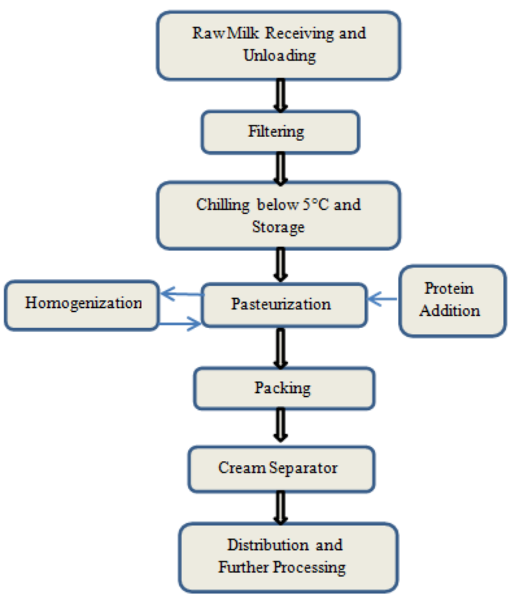

Fig. 2. Operations in Milk Processing

carried out in a milk processing industry thoroughly. Through this experience all the levels of Kolb's learning cycle were covered.

4. Assessment of the experiential learning pedagogy is carried out through feedback and surveys obtained from employer and students.
5. The detailed analysis of the data obtained is carried out.
6. Evaluation of the effectiveness of the adopted learning pedagogy was verified using a mathematical model.

The details of this learning experience and its impact are presented in the following sections.

IV. IMPLEMENTATION

Any milk processing industry typically includes the unit operations as presented in the flow chart shown in Fig. 2.

These all-mentioned operations need accurate control of temperature, flow, level, pressure and developing control schemes to ensure quality output. All these topics were covered to the first group of students out of 69 students of the class using conventional teaching learning methods. As an outcome of this, thorough understanding of the process, analysis and developing the required control loops is expected from the students. The second group of students was asked to visit Katraj dairy plant by completing the administrative procedure following the first stage "Concrete Experience" from learning cycle. They observed the various operations, sequencing in milk processing and interacted with supervisors there. These students studied all the operations, sensing techniques, sequencing used, analysis of control loops in detail thereby going through second and third stage of "Reflective Observation" and "Abstract Conceptualization".

The students came up with some queries of their own and discussed it with the technical operators over there. With this experience they could analyze the total process thoroughly and develop some control strategies of their own showing "Active Experimentation".

To evaluate the understanding and logical development of both the groups, systematic feedback was collected from the students. A detailed questionnaire was prepared based on the Course Outcomes of this specific course. The outcomes of this course are related to identifying the process characteristics, analyzing the process, developing, and designing the control loops for a typical process.
Accordingly, the feedback form was designed and shared with all the class students. The feedback questions are as below.

1. Are you able to understand the operations in the given milk processing Industry?
2. Are you able to identify the characteristics of the given milk processing Industry?
3. Are you able to compare various control strategies and select appropriate control strategies required for pasteurization application?
4. Are you able to analyze the control loops required for processes like pasteurization, separation, and homogenization?
5. Are you able to develop control loops for temperature and flow control in milk processing?

The questions were rated on the scale of satisfactorily (rating 1), moderately (rating 2) and confidently (rating 3).

Rating 1 satisfactorily refers to very basic knowledge and only awareness of the control loops indicating that the students just remember the process.

The rating 2, moderately indicates good knowledge and understanding of the control loops creating interest and

motivation in students. Rating 2 specifies that the students can understand the process.
The rating 3 confidently means the students have strong knowledge of the process and were confident to analyze and develop control loops. This indicates that the students have understood the process thoroughly and are able to Analyze the process.

The feedback was collected from all the students i.e. Group 1 that followed conventional method and Group 2 that followed experiential learning by visiting the dairy plant. This feedback was based on self-assessment and explained to students prior to survey.

The detailed analysis was carried out by applying statistical techniques. It is presented in the results and discussion section. With the use of experiential learning logical thinking and analytical skills of the students improved. This has also enhanced the industry readiness of the students. To validate this, feedback from the students and regular recruiters from core companies was collected during the placement process.

A detailed analysis of this feedback was carried out. The questionnaire for students' feedback is as below.

1. Did this activity help you build confidence for facing interviews?
2. Were you able to attempt and clear the technical test round of the placement process?
3. Did this activity help you to analyze and propose engineering solutions to situation-based questions asked during the interviews?
4. Were you able to answer the interview questions based on recent trends and technologies used in process industries?

The questions were rated on the following scale.

1. Confidently (rating3)
2. Moderately (rating 2) and
3. Satisfactorily (rating 1).

The questionnaire for employers' feedback is as below.

1. Did you find the students technically competent?
2. Did you observe the logical and analytical ability and practical approach of the students towards problem solving?
3. Were the students aware of recent trends and technologies related to the instrumentation field?
4. Did you observe the improvement regarding the industry readiness of students?

The questions were rated on the same scale as that of the students' feedback.

V. MATHEMATICAL MODEL

A mathematical model to formalize relationships between key variables, such as Student competency improvement, industry readiness and employability is developed.

The nomenclature used for the model is as below

C(t) = Competency level of students at time t
R(t) = Industry readiness of students at time t
E(t) = Employability of students at time t
L(t) = Level of experiential learning activities (e.g. Industrial visits, Internships) at time t
F(t) = Feedback from students and employers at time t
S(t) = Sustainability factor at time t, which is influenced by the institutional resources and industry partnerships

Model Equations are as follows:

1. Competency Improvement

$$\frac{dC(t)}{dt} = \alpha\, L(t) - \beta\, [C(t) - C_0] \qquad (1)$$

α = Rate at which experiential learning improves competency
β = Natural decay rate of competency without continued experiential learning.
C_0 = Baseline competency level before the introduction of experiential learning

2. Industry Readiness

$$R(t) = \gamma\, C(t) + \delta\, F(t) \qquad (2)$$

γ = Weight of competency on industry readiness
δ = Weight of feedback from students and employers on industry readiness

3. Employability

$$E(t) = \theta\, R(t) + \varepsilon\, L(t) \qquad (3)$$

θ = Weight of industry readiness on employability
ε = Direct impact of experiential learning on employability through skills and networking

4. Sustainability factor

$$S(t) = \varepsilon_1\, L(t) - \eta\, R(t) + \varepsilon_2\, F(t) \qquad (4)$$

ε_1 = Contribution of experiential activities to sustainability
η = Potential depletion of resources or industry fatigue our time
ε_2 = Positive feedback loop from Industry and students that reinforces sustainability.

From this model various parameters values are calculated. The analysis of the feedback and the model parameters is presented in the results and discussion section.

VI. RESULTS AND DISCUSSIONS

This section presents the responses obtained through the feedback taken and the detailed analysis. The students' responses for every question on the feedback on course outcomes are presented graphically in Figs. 3, 4, 5, 6 and 7.

Q1. Are you able to understand the operations in the given milk processing Industry?

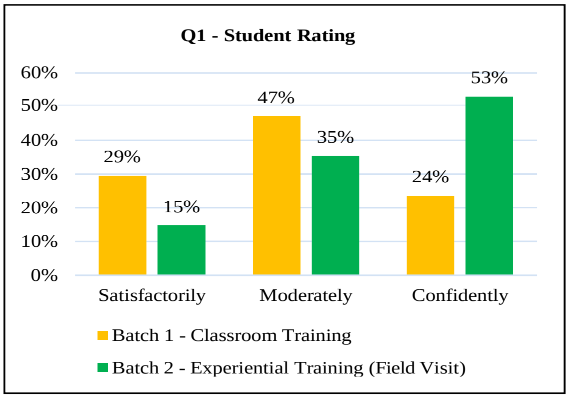

Fig. 3. Responses to Q1

From the responses to Q1, 53% of Students from field visit batch feel more confident, as against only 24% from Classroom training batch, indicating they have understood the processes thoroughly.

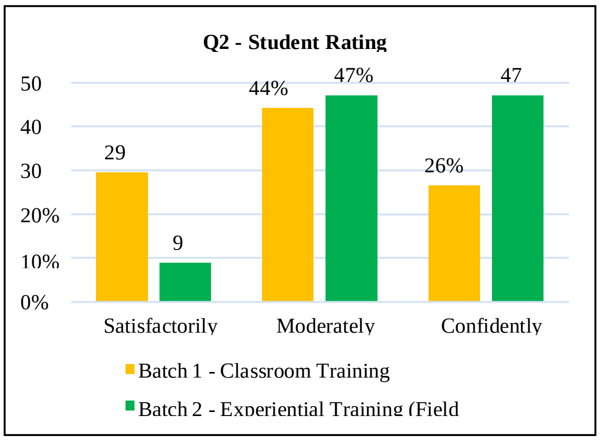

Fig. 4. Responses to Q2

Graph for Q2 shows 47% of Students from Experiential learning (industry visit) batch were confidently, able to clearly identify the various characteristics like accuracy, response time etc. of the process as against only 26% from Classroom training batch. Even, % of moderately has improved from 44% to 47%.

Q3. Are you able to compare various control strategies and select appropriate control strategies required for pasteurization application?

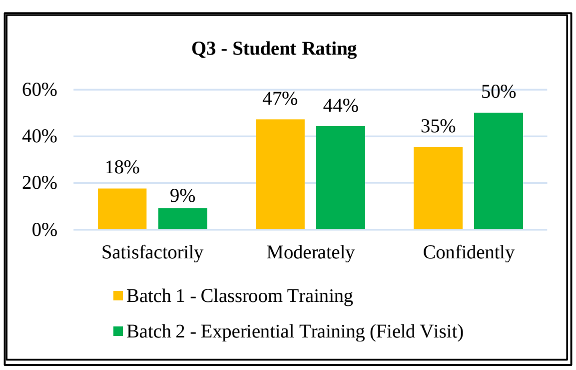

Fig. 5. Responses to Q3

As shown in the Q3 graph, 50% of Students from Experiential learning (field visit) batch were more confident to select and apply the control algorithms for the processes, as against only 35% from Classroom training batch.

Q4. Are you able to analyze the control loops required for processes like pasteurization, separation, and homogenization?

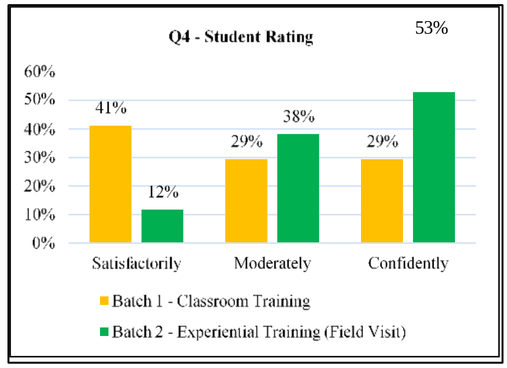

Fig. 6. Responses to Q4

Q5. Are you able to develop control loops for temperature and flow control in milk processing?

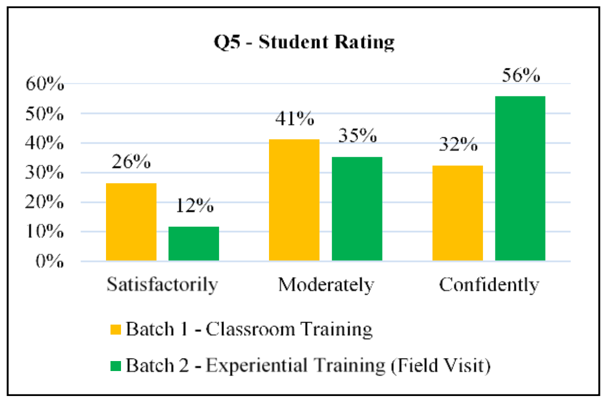

Fig 7. Response to Q5

Graphs for Q4 and Q5 reflect, 53% to 56 % of Students following Experiential learning were confident to analyze and develop various control loops required in the operations involved in milk processing as compared to 29% from Classroom training batch. Even, percentage of moderately is showing good improvement. Cumulative analysis of the responses obtained for all the 5 questions is shown in the graph in Fig 8.

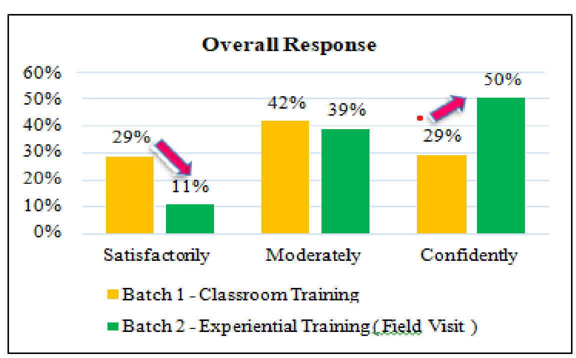

Fig 8. Cumulative Analysis

The cumulative analysis is shown in the graph of overall response. The graph clearly indicates that by visiting the industry students' have understood the process thoroughly. It was observed from students' responses that the understanding, analyzing ability and logical thinking ability of more than 50% of students has significantly improved. The percentage of satisfactorily has also dropped to only 11%.

The students' responses for every question on the feedback taken during the placement process are presented graphically as shown in Fig. 9, 10, 11 and 12.

Q1: Did this activity help you build confidence for facing interviews.

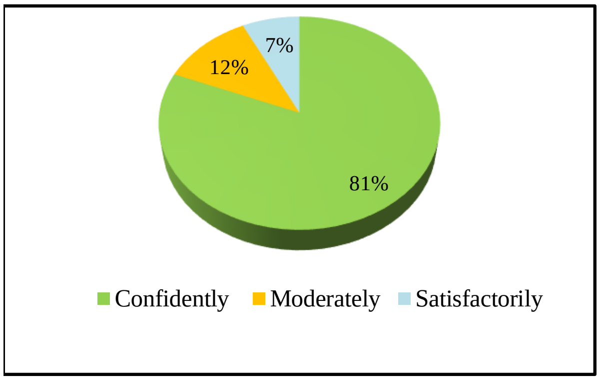

Fig 9. Response to Q1 of feedback of Placement Process

From the responses to Q1, it is prominently observed that 81% of students found themselves confident while facing the interviews.

Q2: Were you able to attempt and clear the technical test round of the placement process?

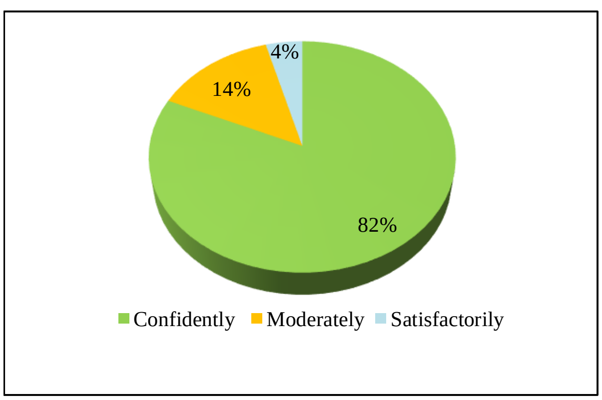

Fig 10. Response to Q2 of feedback of Placement Process

A significant percentage of students clear the technical test round of the placement process as seen from the graph for Q2.

Q3: Did this activity help you to analyze and propose engineering solutions to situation-based questions asked during the interviews?

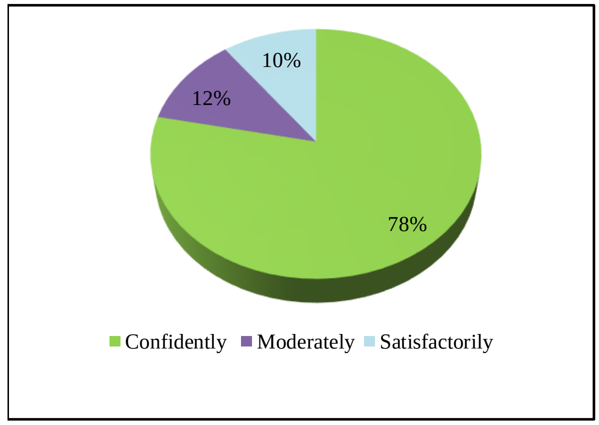

Fig 11. Response to Q3 of feedback of Placement Process

Q4. Were you able to answer the interview questions based on recent trends and technologies used in process industries?

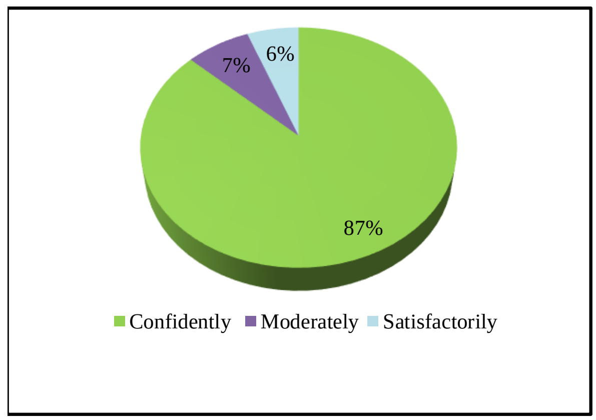

Fig 12. Response to Q4 of feedback of Placement Process

As seen from graphs of Q3 and Q4 most of the students were able answers on recent technologies and application from process industries.

Similarly, feedback is also taken from the regular recruiters from core companies based on technical competency, logical and analytical ability, awareness of recent trends and technologies and industry readiness. The graphical responses obtained are shown in Fig 13 and 14.

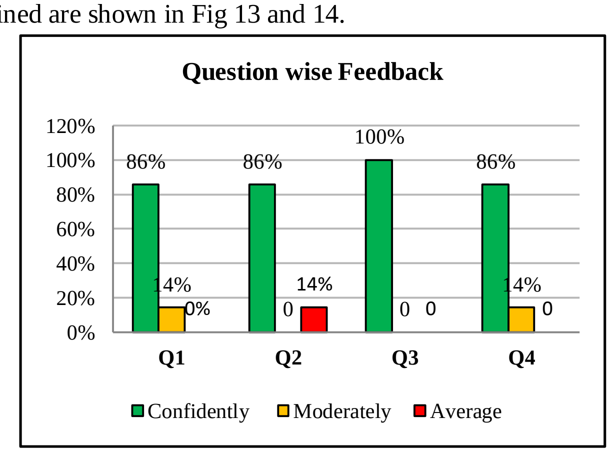

Fig 13. Response to all feedback questions from recruiters during Placement Process

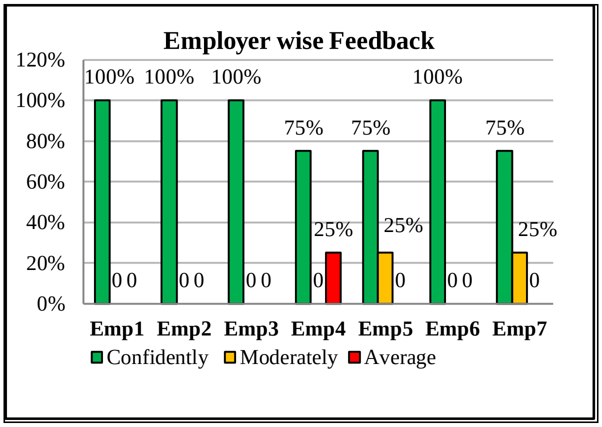

Fig 14. Employer wise feedback

The above two graphs indicate that most of the employers have given good ratings. For authentication of Feedback Analysis, statistical T test for the responses obtained was also carried out. The T test results are shown in Table I:

TABLE I
STATISTICAL T-TEST ANALYSIS
T-TEST: TWO-SAMPLE ASSUMING UNEQUAL VARIANCES

Parameter	Classroom Training Score	Experiential Training (Field Visit) -Score
Mean	2.05	2.35
P(T<=t) two-tail	0.0004699 94	

In statistics, t-test is used to verify the hypotheses about the mean of a small sample drawn from a data set. Random samples were drawn from both the groups. The t-test was performed using excel. From t- test mean and P-value (probability) were computed. As suggested in this test, the expected P-value should be less than 0.05 to authenticate the hypothesis. The calculated P-value for the analysis is 0.00046 with 95% confidence level strongly supports the hypothesis.

It is statistically proved that scores of the batch doing Experiential Training (industry visit) are higher than scores of the batch doing only Classroom Training. This total study and inferences drawn from statistical feedback analysis proves that the pedagogy adopted for this course is really helping to improve students' performance and analytical thinking ability.

The following section presents a typical case study for computing the model parameters and its analysis.

Case Study

Considering the following parameter values, each variable of the model is computed:

α = 0.1, The rate at which experiential learning improves competency is moderate, reflecting a steady but not overwhelming impact

β = 0.05, The decay rate of competency without continuous learning is set at a moderate level, indicating that learned skills need reinforcement to remain sharp

γ = 0.5, Competency significantly impacts industry readiness

δ = 0.3, Feedback plays a critical role in enhancing industry readiness

θ = 0.6, Industry readiness is the dominant factor in employability, supported by direct impact of experiential leaning (ε =0.4)

$\varepsilon_{1=}$ 0.7. Experiential learning Contributes significantly to sustainability.

η = 0.2. There is some depletion of resources or industry fatigue overtime.

$\varepsilon_{2\,=}$ 0.5 Feedback contributes positively to sustainability

Computation of each variable

1) Computing Competency Improvement (C)from (1)

$$\frac{dC(t)}{dt} = \alpha\, L(t) - \beta\,[C(t)\text{-}\, C_0]$$

$\alpha = 0.1$, $\beta = 0.05$, $C_0 = 0.5$ initial competency level

L(t) = 1 (constant level of experiential learning activities)

$$\frac{dC(t)}{dt} = 0.1*1 - 0.05\,[0.5\text{-}0.5]$$
$$= 0.1$$

New Competency C_{new} after one unit of time

$$C_{new} = C_0 + \frac{dC(t)}{dt}$$

$$= 0.5+0.1= 0.6$$

2) Computing Industry Readiness (R) from (2)

$$R(t) = \gamma\, C(t) + \delta\, F(t)$$

γ =0.5, δ=0.3, F(t)= 1 (Constant feedback rate)

$$R_{new} = 0.5 * C_{new} + 0.3 *1$$

$$= 0.6$$

3) Computing Employability (E) from (3)

$E(t) = \theta\, R(t) + \varepsilon\, L(t)$

θ = 0.6, ε = 0.4, L(t) = 1 (constant of experiential learning activities)

E new = 0.6 * Rnew + 0.4*1

= 0.6*0.6 + 0.4

= 0.36 + 0.4 = 0.76

4) Computing Sustainability Factor (S) from (4)

$S(t) = \varepsilon_1 L(t) - \eta R(t) + \varepsilon_2 F(t)$

$\varepsilon_1 = 0.7, \eta = 0.2, \varepsilon_2 = 0.5$

$S_{new} = 0.7 * 1 - 0.2 * R_{new} + 0.5 * 1$

$= 0.7 - 0.2 * 0.6 + 0.5$

$= 0.7 - 0.12 + 0.5$

$= 1.08$

Competency Improvement (C) =0:6
It suggests that experiential learning program is effective in enhancing students' skills and knowledge. This indicates that the program is making a positive impact on student's competency level, helping to gain better understanding of concepts and practical skills required in their field.

Industry Readiness (R) = 0.6
This indicates that students are becoming more prepared to meet the demands of industry. This readiness reflects students' ability to apply their Improved competencies to real world situations making them more ready for potential employers. The value also suggests that the program is successfully bridging the gap between academic learning and industry expectations.

Employability (E) = 0.76
This value depicts that students participating in the experiential learning program are more likely to secure employment after graduation. The value also suggests that the combination of improved Competency and industry readiness is significantly enhancing students' chances of being hired. The digital impact of experiential activities, such as internships & industrial visits, further boosts their employability.

Sustainability factor (S) = 1.08
This value of 1.08 suggests that experiential learning program is not only effective but also sustainable over time. A value above 1 | indicates that program is likely to continue providing positive outcomes without depleting resources or causing industry fatigue.

The objective of this paper is to enhance the understanding of core concepts through experiential learning. The analysis of the results from the applied experiential learning method reveals the following key findings:

1. Statistical analysis strongly indicates that this learning method has significantly improved students' understanding and confidence levels.
2. Feedback from employers demonstrates an improvement in students' industry readiness and technical knowledge.
3. Hypothesis testing, using a mathematical model and case study, confirms that the methodology leads to enhanced competency, industry preparedness, and employability.

Overall, the model proves to be sustainable and effectively meets the study's objectives.

CONCLUSION

Today students are exposed to education which is far more interdisciplinary and complex. It requires using creative teaching methodologies to make them understand the subject thoroughly. In this paper, the power of experiential learning is harnessed to effectively make students learn operations in milk processing through industry visit.

Two groups having almost the same size were created. The first group followed the traditional classroom training and the second group followed experiential training through industry visit. A detailed survey was conducted, and statistical analysis was carried out to understand the benefits. It was observed that 50% of the group 2 (industry visit) students are very confident about the subject as compared to just 29% in group 1 (classroom training). In addition to this, significant improvement is observed in the technical knowledge and knowhow leading to enhanced employability. The employers endorsed these outcomes. This clearly shows the power of experiential learning. The results are authenticated by carrying out statistical t-test. The P- value (0.00046) obtained is less than 0.05 strongly supports the presented hypothesis. This has encouraged us to deploy experiential learning technique in more and more interdisciplinary, complex subjects and make it a vital way of learning for students going forward. The contribution of experiential learning activities and positive feedback from students and employers is helping to maintain the program's long-term viability.

REFERENCES

Steven R. Hall, Ian Waitz, Doris R. Brodeur, Diane H. Soderholm, and Reem Nasr (2002). Adoption of Active Learning in a Lecture-Based Engineering Class. *Proceedings - Frontiers in Education Conference*, T2A-9.

Devi Akella (2010). Learning Together: Kolb's Experiential Theory and its Application. *Journal of Management & Organization, 16*, 100-112.

N.V. Ratnalikar (1999). Engineering Education in India: Need for Pedagogy, Quality and Professionalism. *Journal of Engineering Education and Transformation, 12(12)*, 121-125.

Aniket Prabhavalikar, Madhav Patil (2022). Implementation of Active Learning Tools in Modern Pedagogy. *Journal of Engineering Education and Transformation, 35(12)*, 112-119.

T.S. Desai, D.S. Kulkarni Madhav Patil (2022). Assessment of Interactive Video to Enhance Learning Experience: A case Study', *Journal of Engineering Education and Transformation, 35*, 1274-80.

Dr. Vaishali Upadhye, Dr. Swati Madhe, and Dr.Atul Joshi.(2022). Project Based Learning as an Active Learning Strategy in Engineering Education. *Journal of Engineering Education Transformations, 36(1)*, 18-24.

Pratima Kulkarni, Dipali Ramdasi (2022). Project-Based Learning Technique for Holistic Development of Students. *Journal of Engineering Education Transformations, 36(1),* 56-62.

Abdulkareem Sh. et. al.(2013). The Use of Industrial Visits to Enhance Learning at Engineering Courses. *Journal of Engineering Science and Technology, 8,* 1-7.

Tushar Kanti Sen (2013). The Importance of Industrial Visit to Enhance Student's learning in Process Instrumentation and Control Unit of Engineering Courses. *Proceedings of the European Conference on Education*.

Roddiadeee Nordin et.al (2012). Preliminary Study on the Impact of Industrial Talks and Visits towards the Outcome Based Education of Engineering Students. *Procedia - Social and Behavioral Sciences*, 271–276

Gavillet, R. (2018). Experiential learning and its impact on college students. *Texas Education Review, 7(1),* 140-149.

John A. DeGiacomo.(2002). Experiential learning in higher education. *The Forestry Chronicle, 78(2),* 245-247.

S M Mamatha.(2021). Experiential Learning in Higher Education. *International Journal of Advance Research and Innovation, 9(3)*, 214-218.