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Evaluating Student Attitudes and Behaviors through SEAL to Achieve Holistic Development in Engineering Education

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***Abstract*--Education in engineering not only focuses on knowledge and technical skills but also ensures equal importance to the personal and interpersonal skills. It should also place a strong emphasis on guiding students' behaviors and attitudes, which are crucial for their development as professionals and contributions to society. While engineering education often device assessment strategies on cognitive and psychomotor skills it might be difficult to evaluate and improve emotional and attitudinal aspects. This article proposes a Social Emotional (SE) cum Active Learning (SEAL) pedagogical strategy to cult this gap and experimented for its succession among Vernacular, Vocational and non-computer background students admitted in the academic year of 2019 in computer science engineering department. Various domains such as CDIO (Conceive, Design, Implement, and Operate) framework, the Affective Domain of teaching, Social and Emotional Learning (SEL) are all considered on devising SEAL, and a list of planned activities from the first to the end of semester is recommended for long term behavioral monitoring and assessment. The SEAL is exercised to gauge and improve students' behavioral attitudes, which will help them in their personal, professional, and academic lives through the suggested key performance indicators (KPI). The indicators are self-awareness, self-management, social awareness, Relationship (inter personal) skills and Decision Making. KPI are mapped along with activity based Learning strategies conducted in theoretical and practical courses. The effectiveness of the suggested strategy in enhancing students' development, self-confidence, and job prospects has been experimentally verified. This comprehensive approach aims to foster students' emotional intelligence, interpersonal abilities, and general well-being while also supporting their cognitive growth. In order to obtain a well-rounded education, the article emphasizes the significance of taking into account of Graduate Attributes such as Knowledge, Skill and Affective domains. This study ardently promotes experimental activities that harmonize academic accomplishments with students' behavioral outlooks, thereby achieving comprehensive program outcomes. It further furnishes a viable pathway to assess student attitudes and behaviors throughout their academic duration. Importantly, while cognitive domains receive considerable attention, equal emphasis on the affective domain and the cultivation of social-emotional learning is essential for holistic development was the motive for designing SEAL.**

Keywords: **Activity Based Learning; Engineering Education; Social Emotional Learning; CDIO framework; Affective Domain**

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I.INTRODUCTION

Teaching is a noble profession that is not limited by technology, even with the growing advancements of AI. While technology can improve certain aspects of education, the core of teaching lies in the human connection, emotional intelligence, and the holistic development of students' attitudes, behaviors, and personal skills. Teaching always goes beyond the scope of technology. While technology can be a valuable tool for teachers, it cannot replace the human touch that is essential for effective teaching [1].Cognitive, affective, and psychomotor domains are sensitive and considered as Engineering Graduate Attribute, but the affective/affinity domain requires human engagement for appropriate understanding, assessment, evaluation, and improvement [17]. All domains are significant, but the affective domain deal with complicated and personal emotions, attitudes, and values. Only human educators have the intuition and empathy to navigate Behavioral domain [15].
Incorporating CDIO (Conceive, Design, Implement, and Operate), Outcome-Based Education (OBE), and Social-Emotional Learning (SEL) techniques helps educators manage assessment and evaluation complexities in affective domain.

CDIO Framework: The CDIO approach integrates technical knowledge with personal and interpersonal skills for an engineering education [7]. Teachers engage pupil technical skills (cognitive domain) and ethical, teamwork, and communication (affective domain). This well-knitted strategy develops skilled and socially responsible employees. Outcome based Education (OBE) is Learner Centric paradigm as it focus on learning outcomes. In the emotional domain, educators can define and measure attitudinal and behavioral outcomes to recognize and encourage students' empathy, ethical decision-making, and leadership growth.

These outcomes require qualitative evaluation rather quantitative, which requires human insight and efforts for long term monitoring and assessment [4] [9].

Social-Emotional Learning (SEL): SEL help learners to understand and control emotions, form meaningful relationships, and make responsible choices.

Teachers foster SEL through encouraging pupils to express themselves, build self-awareness, and develop emotional intelligence [3][9][16].

The delicate nature of SEL issues needs educators to guide, encourage, and provide personalized feedback. The SEL induced frameworks recognize the emotive domain and emphasize the idea of the human educators to better understand and self-driven. Different aspects of Social-Emotional Learning (SEL) and the Affective Domain within the CDIO framework can be addressed through various activities, ensuring the achievement of Program Outcomes 8 to 12 (PO8-PO12) are depicted in table 1.

By integrating the foundational principles originating from Social and Emotional Learning (SEL) and the Affective Domain (As illustrated in figure 1), alongside the specific objectives outlined in program outcomes PO8: Ethics, PO9: Individual and team work, P10: Communication, P12: Life-long learning, a harmonious convergence can be accomplished [5] [12]. Through our proposed pedagogical methodology, we actively promote all-encompassing enhancement of students' behavioral tendencies and attitudinal dispositions. This comprehensive strategy not only harmonizes with scholastic goals but also fosters indispensable life proficiencies that profoundly contribute to personal growth and overarching achievement. Throughout the duration of the course, a meticulous monitoring and assessment of students' developmental progress in behavior and shifts in attitude are carried out. This rigorous tracking mechanism ensures the utmost efficacy of our seamlessly unified approach.

TABLE 1:
INTEGRATION OF SEL AND AFFECTIVE METRICS FOR PO8-PO12 ENHANCEMENT

Program Outcomes	Social Emotional Learning Key Components [6]					CDIO-Affective Domain				
	Components									
	self-awareness	self-management	social awareness	relationship skills	responsible decision-making	Receive	Response	Valuing	Organizing	Characterizing
	Rubrics devised in Activity									
	Own strengths and weaknesses	Control the emotions	Recognize and respond to others' emotions.	Team Collaboration and Communication	Cognitive and creativity	Willing for accept the value	Active participation	Self-Improvement	Preference or priority of value	Compare, relate and synthesize the value
PO8-Ethics	L	L	M	S	S	L	L	M	M	M
PO9-Individual and Team Work	L	M	S	S	L	S	S	S	S	S
PO10-Communication	L	L	S	S	S	L	M	M	M	M
PO 11 –Project Management	L	M	S	S	S	S	S	S	S	S
PO12-Life Long Learning	S	S	S	M	M	M	M	M	S	S

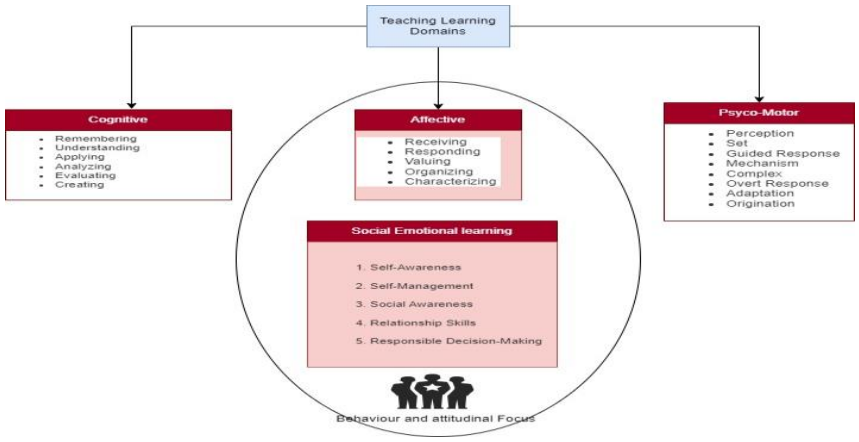

Figure 1: Focusing Metrics to measure students behavior attitude and emotion in Learning

In a cohort of 140 computer science and engineering branch students admitted in the year 2019, there were 12 Vernacular medium students, 65 students specialized in biological sciences, and an additional 3 pursuing vocational studies in their higher secondary. Vernacular Students from Tamil medium and biology backgrounds often encounter challenges during their initial semester in engineering education [10]. These difficulties may encompass language barriers, a lack of confidence due to stage fear, hesitation in social interactions, and struggles with adjusting to a new academic environment [11]. 60 % Biology

students with little to no prior experience in computer science often find it difficult to learn computer terminology and programming languages in their first semester. This is because the two disciplines use different vocabularies and ways of thinking. Additionally, gender-related concerns, financial disparities, feelings of depression, and reduced motivation to engage in extracurricular activities can further impact the teaching-learning process. Recognizing these challenges is crucial for educators, enabling them to take proactive measures to address and overcome these obstacles. Need of Devising a range of activities tailored to enhance students' cognitive, emotional, behavioral and attitudinal development within both theory and lab courses. These activities should be carefully integrated into the curriculum to yield measurable results in both academic achievements and emotional well-being.

Faculty attributes encompassed confidence, proactive participation in learning, willingness to extend learning beyond the curriculum, ethical orientation, teamwork skills, effective communication and occasional concerns. The targeted subset consisted of 22 students out of the total 140 from 2019-2023 Academic batch. During in class activity observation they were characterized by strong academic aptitude but limited self-assurance, communication challenges, classroom passivity, and social anxiety. Their cognitive attributes related to Bloom's affective domain and SEL were meticulously examined and documented throughout their inception of engineering program. This observation is a long term process throughout the subsequent years encompassing CDIO courses from the second to the final year as given in table 2.

TABLE 2:
IMPLEMENTATION OF SEAL IN ENGINEERING EDUCATION

Semester	**Implementation of SEAL**	
	Core Course	CDIO Course
I	Programming Paradigm (Theory)	Engineering Exploration (Team Activity)
II	Computer Programming (Theory cum Lab)	Lateral Thinking (Team Activity)
III	Data Structure (Theory cum Lab)	Design Thinking (Team Activity)
IV	Operating Systems (Theory cum Lab)	
V	Web Programming (Theory cum Lab)	System Thinking (Team Activity)
VI	Engineering by Design (Lab)	
VII	Capestone Project (Practical)	
VIII	Project (Practical)	

The ensuing section delineates the methodologies trialed in the program, presenting a clearly defined approach for implementing objectives and detailing resultant outcomes. This SEAL approach has demonstrated that students who engage in these activities exhibit increased enthusiasm to participate in problem-solving endeavors, excel in inter and intra college competitions, and independently pursue MOOC courses for continuous learning and self-improvement.

II. METHODS

A 15-day orientation program is conducted in the first semester to familiarize students with college policies. Regular meetings are held for students from Tamil medium, vocational, and biology backgrounds to address their challenges and requirements. The activities integrated into theory and lab courses encompass both team and individual engagements, structured as follows: Each experimental activity is meticulously outlined with implementation tactics and specific metrics, highlighting the focus on assessing students' behavioral and ethical attributes within the classroom setting [11].Before conducting any planned activity in class, a teacher's role encompasses the following preliminary tasks [15]:

Schedule, Instruction and Objective Definition:

In preparation for conducting planned activities in the classroom, teachers play a pivotal role in ensuring the clarity of learning goals and outcomes, allocating suitable time within the lesson plan, and skillfully crafting concise and comprehensible instructions to guide students effectively.

Resource Planning:

The teacher's responsibility extends to coordinating physical resources such as classrooms, laboratories, projectors, microphones, and related materials. Additionally, strategic planning of manual resources, including the involvement of teaching assistants if necessary, contributes to the seamless execution of the event [18].

Student Management:

Recognizing students and discerning areas for enhancing their skills and attitudes. Facilitating a simple group activity where students encouraged in groups reveals a trend of homogeneity, as boys and girls predominantly opt to collaborate within their respective genders, and high-achieving students cluster with familiar peers.

However, this pattern may restrict the introduction of diverse viewpoints and hinder the potential for collaborative learning experiences. A teacher has the option to assign heterogeneous teams comprising students of varying skill levels and genders, without disclosing the specific criteria for team allocation. This approach promotes diverse collaboration, fostering a dynamic learning environment enriched by varied perspectives and enhanced teamwork skills.

Question and rubrics setting:

In education, the formulation of thoughtful questions and the creation of well-defined rubrics play a crucial role in nurturing not only academic excellence but also the holistic growth of students. Effective questions should be closely aligned with the desired learning outcomes. They should challenge students to analyze, synthesize, and evaluate information, thereby stimulating higher-order thinking. Questions can also incorporate real-world scenarios to encourage students to apply theoretical knowledge to practical situations. Incorporating ethical dimensions into questions can prompt students to consider the moral implications of their decisions and actions. This encourages ethical awareness and behavior, promoting a sense of responsibility and integrity in their academic pursuits. Rubrics need to be comprehensive, providing explicit criteria for assessing academic and behavioral dimensions. Reflect on

the possibility of incorporating sections that encompass not solely content proficiency, but also aspects like individual participation, active engagement, adept decision-making, and effective communication of thoughts, collaborative teamwork, motivation, proficient inquiry and doubt resolution, as well as ethical conduct.

Activity Review and Feedback

The session focuses on evaluating and providing feedback for the proposed activity plan. Participants will collaboratively assess the plan's effectiveness, identify potential improvements, and ensure alignment with intended goals. Constructive feedback will be shared to enhance the plan's overall quality and maximize its impact on student learning [14].Emotional intelligence cannot be taught in the same way that factual knowledge can be taught. It is a skill that must be developed through practice. The Program Outcomes PO8-Ethics, PO9-Individual and Team Work, PO10-Communication, and PO12-Life Long Learning are all indirectly assessed through courses which are challenging tasks. Emotional intelligence can help students to develop these skills and to be successful in their studies and careers [9]. The following activities are implemented in computer science and engineering program to promote ethical and professional behavior among students [11] [12]:

A. Activity 1(In Class Activity)

Activity Name: "Learning via Ethics Assignments"

Problem Identification:

The assignment questions are designed to correspond with the specific learning objectives of the course, and the themes for assignments are chosen from the content covered in the course. A comprehensive set of questions has been organized, wherein each question is allocated to student teams in a random manner. Heterogeneous teams can be formed with various learners of class. This is a great way to promote diversity and inclusion in the classroom, and it can also help students to learn from each other and to develop critical thinking skills.

Rubrics setting:

Rubrics are employed for the assessment of behavioral attitudes, which include team participation, individual contribution, personal expertise, communication, emotional factors, and adherence to the CDIO framework metrics (Receive, Respond, Value, Organize, Internalize) [8].

The confidence, responsibility, and motivation levels of the students are also covered by this activity.

Assessment of Knowledge Mastery and Emotional Competence

Assignments are appraised by other team members, who are then required to substantiate their evaluations to the teacher. This process enhances their proficiency in ethically allocating marks and effectively justifying their viewpoints. Individual contributions, individual expertise, and communication skills are evaluated by the questioning peers and teachers ask about assignments on the spot [13]. Presentations and the ability to understand and answer questions are also used to test communication skills. Also, team members have to give points to peers who helped them understand the ideas on their own time. Notably, the points given for peer help shouldn't be repeated. If a team decides that one member deserves, say, 5 points, those marks shouldn't be given to anyone else.

This method makes sure the student's genuine marks awarding to peer and helps them form emotional bonds. The peer evaluation process makes it easy to see when people share what they know, especially since the peer marks count towards the team's total score, which encourages quick learners to help their peers. Emotional factors like confidence, responsibility, and motivation are shown through their involvement in inter- and intra-college events, which show the visible results of their emotional growth. The weightage of mark assessments are considered as 75% technical stuff and 25% Social and Emotional Learning.

Outcome

The outcomes encompass a range of valuable skills and qualities:

- ✓ Effective Peer Interaction: Ability to build meaningful relationships with new peers.
- ✓ Initiative in Seeking Assistance: Supporting collaborative learning by actively seeking and offering support.
- ✓ Clearing Conceptual Doubts: Asking and answering questions to improve knowledge.
- ✓ Improved Communication Skills: Improved communication skills helped express ideas and concepts.
- ✓ Ethical Mark Allocation: Ability to assign marks ethically and justify evaluations.
- ✓ High Classroom Engagement: Active engagement in class discussions and activities.
- ✓ Effective Presentation Skills: Ability to communicate knowledge through powerful presentations.
- ✓ Improved Confidence: Increased self-confidence in intellectual pursuits.
- ✓ Motivated Participation in competitions and activities, making learning more enjoyable.
- ✓ Nurturing a positive emotional environment for teaching and learning.
- ✓ High Satisfaction: Student feedback on this exercise shows great satisfaction.

These outcomes promote a dynamic, collaborative, and emotionally satisfying learning environment that overrides conventional assignment methods.

B. In Lab Activities in Computer Science Engineering

Students can improve their critical thinking and problem-solving skills, increase their employability, stimulate creativity and innovation through building projects, and learn how to

address real-world problems by learning programming. Programming involves practice and hands-on experience, not just theory. Learners are more engaged and driven when they emotionally appreciate the process. Lack of programming basics, difficulties finding and fixing errors, and lack of practice and motivation plague the current learning system. An emotionally pleasant learning strategy with regular practice can improve learning to handle these obstacles. This method improves learning engagement, creativity, stress, self-esteem, and problem-solving. By adopting a positive mindset and self-interest, students can excel in coding. Interactive quiz games, level-based daily challenges, and error-learning ideas can help. Academic performance, competition participation, certifications, and project development measure these practices' success.

These activities evaluate not only the programming skills of the participants but also their emotional engagement in the learning journey, along with their observable behaviors and attitudinal traits. The activities measure the following aspects of the participants:

Programming competency: This refers to the participants' ability to write and debug code.

Emotional enjoyment: This refers to how much the participants enjoy the process of learning to program.

Behavioral characteristics: This refers to the participants' observable behaviors, such as their attention span, their willingness to participate, their ability to work independently also with peer team.

Attitudinal characteristics: This refers to the participants' beliefs, values, and attitudes towards programming, such as their motivation, their confidence, and their interest in the subject.

By measuring all of these aspects, the activities can provide a comprehensive picture of the participants' learning experience. This information can be used to improve the learning experience for future participants by making the activities more engaging and enjoyable, as well as by providing more support for participants who are struggling [14].

1. Activity 1

Activity Name: "Learning through Practice"

Objective:

- ✓ Diverse Student Engagement
- ✓ Motivation and Habit Formation
- ✓ Stress-free Learning
- ✓ Practical Application
- ✓ Collaborative Learning
- ✓ Holistic Learning Experience

Question Setting:

Our southern Indian institution has a diversified student with vernacular mediums (Tamil and English) and study group (biology, computer and vocational) dynamics from their previous schools. We aim to establish an inclusive and inspirational learning environment that meets the requirements of all students. We created a multi-tiered programming question system with beginner, basic, and advanced levels to do this.

These questions were handpicked from TCS CodeVita, Wipro PRP, CodeChef, and HackerRank to match placement goals. We've made minor changes to ensure distinctiveness while retaining their integrity. Each lab session and certain theoretical sessions will provide extra problems for individual resolution to promote growth. This method improves coding and problem-solving. These exercises are career-relevant, so students have a motivation to actively participate and interact with learning.

No Score Assessment:

Our method works on getting people interested in programming and making it a habit, with an emphasis on how theoretical ideas can be used in the real world. The goal is to make sure that these events aren't just about getting points, so that students can take part without worrying about their grades. This process is meant to be fun so that it doesn't seem like an extra responsibility. During lab classes, a Gmeet link will be given out. This link will take students to a message board where they can post questions and concerns. Any student who knows a lot about a certain subject can give answers. We'll figure out how well each student is doing based on how many more programmes they finish over the course of the term via online technical aids like mentimeter, kahoot, plickers etc. At the end of the course, those who do well in this task will receive a small token of praise to show that they worked hard.

Outcome:

- ✓ Students will be more motivated to learn programming because they are not being graded on their practice sessions.
- ✓ Students will be more likely to develop a habit of programming because they can practice at their own pace and in their own time.
- ✓ Students will gain practical experience implementing theoretical concepts by completing additional programs.
- ✓ Students will be more confident in their programming skills because they will have had the opportunity to practice and receive feedback from their peers.
- ✓ Students will be more engaged in the learning process because they will be able to ask questions and get help from their peers.
- ✓ Students will be more likely to continue learning programming after the course is over because they will have had a positive experience with the practice sessions.
- ✓ Students will improve their written and oral communication skills by having to explain their code to their peers and by asking and answering questions in the Google Meet chat box.

The knowledge and abilities they gain in Activity 1 will make them better participants in Activity 2.

2. Activity 2

Activity Name: "Fun Based Learning"

Objective:

- ✓ Creativity and Problem Formulation
- ✓ Effective Communication
- ✓ Collaborative Teamwork
- ✓ Applied Coding Skills
- ✓ Customer-Centric Programming

Question Setting:

Each student group will be responsible for coming up with their own unique problem that can be solved using computer code. They write extensively on the problem that needs fixing. After that, we compile these issues into a database of queries. Students of varying experience levels are grouped together into teams, and those groups then choose a problem from the repository at random. The group that comes up with the issue is the "customer," and the group that writes the code to fix it is the "techie." Before starting to write code, the technical team communicates with the client team to have a better understanding of their needs. Then they propose a plan to complete that work. They are subsequently given this task. Completed assignments are graded on how well they satisfy customer teams; this helps guarantee that the coded product actually meets their needs.

Assessment

Each team will be assessed from two perspectives: the customer's perspective and the techie's perspective. Customer perspective: The customer will assess the techie team on their problem understanding, periodic communication, completion of all requirements, and demonstration of work. The customer will also give an overall rating for the techie team. Techie perspective: The techie will assess the customer team on their question description, clarity in problem description, and innovation in forming questions. The techie will also give an overall rating for the customer team. Total marks will be derived from both perspectives, reflecting each team's combined performance and unique contributions as depicted in table 3. The team with the highest total marks will be the winner. Implementation sample of activity is shown in figure 2.

TABLE 3
SCHEME OF EVALUATION FOR THE ACTIVITY: FUN BASED LEARNING"

Customer perspective	Marks	Techie Perspective	Marks
Problem understanding	3	Question description	3
Periodic Communication	2	Clarity in problem description	2
Completion of all requirement as per schedule(max of two weeks)	5	Innovation in forming questions	2
Demonstration of work	5	-	-
Overall rate for the techie team	Max 5	Overall rate for the customer team	Max 3
total	20	Total	10

Outcomes:

The activity described here has the potential to have a number of positive emotional and programming skill-based outcomes for students.

Emotional outcomes:

- ✓ Increased confidence
- ✓ Improved communication skills
- ✓ Increased motivation
- ✓ Sense of accomplishment
- ✓ The moral need to accept responsibility for achieving an objective within a given time frame

Programming skill-based outcomes

- ✓ Improved problem-solving skills
- ✓ Increased knowledge of programming concepts
- ✓ Improved debugging skills
- ✓ Increased teamwork skills

Figure 2: Techie Team Explanation Sample.

3. Activity 3

Activity Name:" Learn from Errors-Not only from ours also from others".

Objective:

The primary goal of implementing this teaching and learning practice is to create both academic achievement and positive behavioral attitudes among programming students. The specific objectives are mentioned in table 4 as follows

TABLE 4
OBJECTIVES FOR THE ACTIVITY "LEARN FROM ERRORS"

Academic Objectives	Behavioral Attitude Objectives
Deep Conceptual Grasp	Resilience and Perseverance
Effective Problem Solving	Positive Learning Mindset
Collaborative Learning	Effective Communication
Critical Thinking Development	Constructive Feedback
Self-Directed Learning	Responsibility and Accountability

Implementation:

"I haven't failed. I've just discovered 10,000 ways that won't work." - Thomas A. Edison. Mistakes serve as evidence that we're engaged in action. Those who avoid errors haven't truly ventured. This principle applies universally, particularly in the realm of learning programming. Mistakes are invaluable as they provide profound insights into concepts. They guide us in unraveling errors by necessitating a clear understanding of their nature, causes, remedies, impact on outcomes, and where within the codebase they originate. Efficiently resolving errors demands minimal adjustments and a strategic review of code segments. Hence, errors become fountains of knowledge.

In educational settings, some students, often labeled as slow learners, tend to rectify errors by replicating solutions from peers or online resources without grasping the underlying concepts. To address this, we have devised a strategy. We are developing a repository that documents each student's encountered errors during a session. This repository will encompass the error's manifestation, its root causes, debugging procedures undertaken, and the effects on code execution. Accessible through Google Classroom, this repository encourages all participants to contribute suggestions and insights. These inputs, whether surpassing or matching existing entries, cultivate collaborative knowledge sharing. The approach fosters a constructive mindset where mistakes are embraced as stepping stones to improvement. Hesitation to disclose errors dissipates, replaced by an eagerness to rectify and learn. In essence, the ethos aligns with Edison's perspective, promoting a culture where errors are not hidden but harnessed for growth.

Outcome:

- ✓ The collaborative error library will feature varied errors, solutions, and insights, enriching student learning.
- ✓ Students will write better code through error analysis and feedback, creating more robust, efficient, and maintainable programmes.
- ✓ Students that actively seek out errors perceive mistakes as opportunities, and approach learning with curiosity will develop a growth mindset.
- ✓ As students explore error resolution options, the practice will foster positive criticism and collaboration.

Feedback summary on activities

Feedback plays a pivotal role in refining and enhancing the proposed plan for future batches, offering insights into the effectiveness of the activities through diverse metrics. These metrics encompass engagement levels, satisfaction with the learning experience, time utilization, adherence to the plan, creativity exhibited, team dynamics, opportunities for self-development, knowledge acquisition, perceived difficulty of the activity, general opinions, key takeaways, and identified areas for improvement. These selected metrics are thoughtfully incorporated into various activities, aligning with their specific objectives. The aggregate rating provided by students, rated out of 5, is visually represented in the accompanying graph (figure 3). This comprehensive approach not only ensures a holistic understanding of the impact of the activities but also facilitates a data-driven analysis for continuous enhancement and optimal outcomes across different dimensions of the learning experience [10].

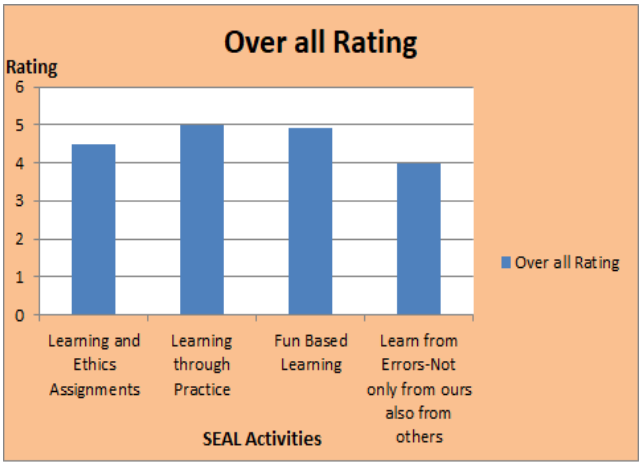

Figure 3: Overall rating for all suggested activities by students.

Over all observation of targeted students at the end of Course

Overall, all of the pupils benefited from the activities that were done. Most students were able to successfully complete their degrees, get employment after graduation, and stay on the same team that they were initially placed in. Additionally, a sizable proportion of students continued higher education, finished certifications, engaged in self-learning, and participated in intra- and inter-college activities. The targeted students benefited the most from the activities that were done. For instance, compared to 98% of all students, 90% of targeted students were hired following graduation. This (statistics depicted in table 5) shows that the activities carried out were especially helpful for students who were having trouble landing a job. The students' professional and personal growth was positively impacted by the activities that were carried out. Students who took part in intra- and inter-collegiate events, for instance, improved their communication and collaboration abilities. Students who earned certifications improved their knowledge and skills, which they could use to their employment. Students that participated in self-learning

improved their ability to learn independently. Additionally, pupils who pursued higher education developed their knowledge and had greater financial potential. The actions that were carried out were successful overall. They were effective for targeted students and had a good influence on all children. The exercises carried out aided students' academic success and the growth of their professional and personal skills [19]. Relatively speaking, this batch of students has achieved an impressive track record in their program of study, encompassing various noteworthy aspects:

TABLE 5
OVERALL IMPACT OF ACTIVITIES ON VARIOUS SUCCESS FACTORS.

S.NO	Impact of activity conducted	Over All(Batch Count:140 Students)	Targeted Students(Count:22)
1	Successful Completion of Degree	100%	100%
2	Got Placed	98%	90%
3	Team Formation –Same Team Till Final year	100%	100%
4	Inter College Activity Participation-Technical	68%	72%
5	Inter College Activity Participation-non-Technical	71%	50%
6	Intra College Activity Participation-Technical	82%	89%
7	Intra College Activity Participation-non-Technical	89%	80%
8	Certification Completed	60%	50%
9	Self-Learning	50%	40%
10	Higher Learning	25%	5%

Emotion-Centric Learning as a Pivotal Driver of this Achievement. As educators, it is our responsibility to nurture well-rounded individuals for society, enhancing not only their academic prowess but also their holistic development through our proposed approach [20].

III. CONCLUSION

This article has demonstrated the effectiveness of integrating SEL and the CDIO framework's Affective Domain to focus on Programme Outcomes: PO8, PO9, PO10, PO11 and PO12. The proposed approach has facilitated the implementation of various activities that help teachers measure and track students' attitudinal and behavioral progress. This approach offers a clear methodology for assessing student behavior, which is pivotal in realizing the objectives outlined in PO8 to PO12 within the academic curriculum. The SEAL has also identified some challenges, such as the difficulty of identifying and forming teams during the initial semesters. However, these challenges can be effectively addressed through modest interactions and attentive supervision during lecture sessions. Additionally, the efficient management of time and meticulous pre-planning remain vital hurdles, warranting consideration.

In the future, the proposed approach could evolve into a structured framework that covers both behavior-focused and academically oriented activities in the initial year. This framework aims to cultivate a positive learning encounter, building the necessary motivation and confidence for real-world challenges. Subsequently, starting from the second year, integrating CDIO project-based courses like engineering exploration, design thinking, system thinking, project management, and project phases throughout each semester becomes crucial for consistently monitoring student attitudes. This is because evaluating attitudes and behaviors comprehensively requires more than a single course or semester. Additionally, students' co-curricular and extracurricular involvements are meticulously logged and documented to ensure the accomplishment of our goals.

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