Integrating Project-Based Learning in Foundational Sciences through Course Level Projects (CLP): From Classroom to Expo.

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***Abstract*— This study explores the integration of Course-Level Projects (CLPs) in freshman engineering education to bridge the gap between industry and academia and prepare students for Project-Based Learning (PBL). Addressing the problem of traditional theoretical teaching methods that fail to equip students with practical skills, our research hypothesizes that CLPs enhance the application of theoretical knowledge and develop industry-relevant skills. Study conducted at an engineering college- Hyderabad Institute of Technology and Management (HITAM) in South India,where we employed a phased approach, incorporating CLPs into Physics and Chemistry courses, with guidance from faculty and industry mentors. Data was collected through interviews and surveys, analyzed using thematic coding. Findings indicate that CLPs provide real-world experience, improve teamwork, and develop critical skills, thus effectively preparing students for PBL and professional careers. The results support our hypothesis, demonstrating that CLPs align academic learning with industry needs. Future research should investigate the long-term impact ofCLPs on career progression and further refine this educational approach.**

***Keywords*— Engineering Education; Course Level Projects; Project-Based Learning (PBL); Theoretical Knowledge; Traditional Teaching Methods.**

I. INTRODUCTION

Course-Level Projects (CLPs): CLPs are specific practical assignments integrated into a single course's curriculum, designed to apply theoretical knowledge to real-world challenges within the context of that course (Dabbagh & Kitsantas, 2012). Project-Based Learning (PBL): PBL is an educational approach where students engage in long-term, interdisciplinary projects that address complex, real-world problems, fostering a wide range of skills through student-driven inquiry and collaboration (Thomas, 2000).

Our institution is adopting a phased approach to implement Project-Based Learning (PBL) by introducing Course-Level Projects (CLPs) as a pilot model for freshman engineering students this year. This strategic move allows us to transition smoothly from a structured, course-specific approach (CLPs) to a broader, interdisciplinary, and student-driven methodology (PBL) in the subsequent academic year. By initiating CLPs first, we can refine our pedagogical strategies, prepare faculty and students for the increased autonomy and scope of PBL, and ultimately foster a more immersive and practical learning environment (Strobel & van Barneveld, 2009).

Freshman engineering students typically enter college with a strong theoretical foundation from textbooks and lectures. However, transforming abstract scientific concepts into practical tools requires hands-on training. The industry seeks problem-solvers, not just degree-holding graduates. Many freshmen initially focus on passing tests rather than engaging in cognitive learning and self-motivation (Bell, 2010). Introducing CLPs in the first year of engineering can bridge this gap,helping students apply scientific principles to real-world engineering problems and fostering deeper learning, practical skills, and problem-solving abilities (Prince & Felder, 2006). Additionally, hands-on experience enhances collaboration and teamwork skills, preparing students for the demands of Industry 4.0 (Schwab, 2016).

CLPs are globally conducted, which resulted in successful outcomes (Prince & Felder, 2006).

MIT (USA): Students in the EPICS program designed and implemented water purification systems for communities lacking clean water (Coyle, Jamieson, & Oakes, 2005).

Aalborg University (Denmark): Engineering students developed sustainable energy solutions, such as solar-powered devices and energy-efficient building designs (Kolmos, 1996). University of Tokyo (Japan): Projects included the creation of robotics for disaster response and automated agricultural systems to support precision farming (Matsuda & Matsui, 2009).

The Course-Level Project (CLP) concept has been successfully implemented in various educational institutions across the country. For instance, the Indian Institute of Technology (IIT) Madras has integrated CLPs into their engineering curriculum, yielding innovative projects such as sustainable water management systems (Iyer & Velusamy, 2020). Similarly, IIT Bombay has engaged freshman students in developing low-cost medical devices and affordable housing solutions using locally sourced materials (Joshi & Deshmukh, 2016). Additionally, BITS Pilani has utilized CLPs to encourage students to design low-cost medical devices, showcasing the practical application of theoretical knowledge (Mishra & Acharya, 2019). These examples demonstrate

LITERATURE

TABLE 1

Study	Title	Key Findings	Conclusion Findings
Dabbagh and Kitsantas (2012)	Personal Learning Environments	Highlights the importance of integrating practical assignments into courses to enhance learning outcomes and student engagement.	CLPs provide a structured framework within a single course, allowing students to apply theoretical concepts, which prepares them for the broader, interdisciplinary scope of PBL.
Prensky (2010)	Teaching Digital Natives	Discusses the need for incorporating real-world challenges in the curriculum to meet the learning preferences of digital natives.	CLPs engage students with real-world challenges in a controlled environment, gradually building the skills and confidence required for independent, interdisciplinary PBL projects.
Barron et al. (1998)	Doing with Understanding: Lessons from Research	Emphasizes the effectiveness of hands-on projects in promoting deeper understanding and retention of course material.	CLPs serve as a preliminary step, fostering the necessary skills in research, collaboration, and problem-solving that are essential for successful participation in PBL activities.

effective adaptation of CLPs in fostering hands-on learning, innovation, and real-world problem-solving skills in students across India's educational landscape.

Implementing Course-Level Projects (CLPs) in the freshman year has yielded a positive impact on students' subsequent academic journey. By gaining hands-on experience and practical skills early on, students are better equipped to tackle more complex projects and coursework in their sophomore year with increased confidence and competence (Prince & Felder, 2006). This foundational experience has effectively bridged the gap between theoretical knowledge and real-world application, setting them up for success in their future academic and professional pursuits (Dabbagh & Kitsantas, 2012).

In recent years, educational institutions across ASEAN countries have been embracing innovative teaching methods to boost student engagement and learning outcomes (Chickering & Gamson, 1987). One such approach is active learning, which encourages students to take a hands-on role in their educational journey. HITAM has pioneered the "Doing-Engineering" concept, incorporating Course-Level Projects (CLPs) into its curriculum. CLPs are comprehensive, course-specific assignments that span an entire semester, enabling students to apply theoretical concepts to real-world problems. The CLP framework comprises multiple stages: research and planning, problem identification, solution design and implementation, and continuous refinement through feedback and data analysis. The effectiveness of CLPs is evaluated based on specific course outcomes, including mastery of course material, application skills, and project quality (Prince & Felder, 2006). By integrating CLPs, the HITAM aims to foster a deeper understanding of engineering principles, develop practical skills, and cultivate innovative thinking among its students.

Traditional teaching approaches often prioritize lectures and theoretical knowledge, leaving students ill-equipped to tackle real-world challenges and industry expectations (Bell, 2010). Furthermore, there is a notable absence of structured active learning and hands-on projects, particularly during the freshman year, to cultivate crucial skills like creativity, communication, and adaptability from the outset of engineering studies. This research seeks to bridge this gap by introducing Course-Level Projects (CLPs) as a pilot initiative, laying the groundwork for more extensive Project-Based Learning (PBL) programs. By doing so, it aims to provide students with a comprehensive learning experience that combines theoretical foundations with practical application, empowering them to succeed in their future careers (Strobel & van Barneveld, 2009)..

II. OBJECTIVE

This study aims to address two important questions: How do Course-Level Projects (CLPs) enhance the application of theoretical knowledge to real-world engineering challenges for freshman students? How does the introduction of Course-Level Projects (CLPs) in the freshman year facilitate the transition to Project-Based Learning (PBL) in subsequent academic years? The ultimate goal is to create a dynamic and effective learning environment that aligns with industry needs and prepares students for real-world challenges (Prince & Felder, 2006).

Previously, course assessments relied on two written tests, conducted over a 16-week period, which primarily evaluated students' memory and knowledge of concepts, aligning with Bloom's Lower Order Thinking Skills (LOTS). However, the demands of Industry 4.0 require engineers to possess Higher Order Thinking Skills (HOTS), emphasizing application, analysis, and critical thinking (Schwab, 2016). To bridge this gap, it is essential to revamp the assessment strategy to focus on HOTS, ensuring students are adequately prepared to meet the industry's evolving needs (Anderson & Krathwohl, 2001).

To align with the PBL framework, all freshmen engineering courses underwent a transformation, replacing traditional Course Outcomes (COs) with Intended Learning Outcomes (ILOs). This shift enabled constructive alignment, ensuring that course objectives and assessments were harmoniously linked to foster a cohesive learning experience (Biggs, 2003). Mapping projects to learning outcomes: Ensuring alignment between PJBL projects and the intended learning outcomes is crucial for meaningful integration. By mapping projects to specific learning objectives, faculty members can demonstrate the relevance of PJBL to students' academic and professional development (Sutrisno Sadji Evenddy et al., 2023). This alignment enhances coherence and highlights the connections between theory and practice. Through Course Level Projects, students learn to set goals, manage their time effectively, and take responsibility for their learning (Bagheri et al., 2013). Furthermore, PJBL plays a pivotal role in the development of self-directed learning skills among students.

The revised course outcomes for Physics and chemistry are showcased below, demonstrating the alignment with PBL principles.:

A. Chemistry Course Outcomes

TABLE 2

	COs with LOTS		Reframed to ILOs with HOTS
CO1	**Explain** the of electrochemical procedures related tocorrosion and its control.	ILO1	**CO 1: Identify** the concepts of electrochemistry and corrosion toengineering applications.
CO2	**Understand** the basic properties of water and its usage indomestic and industrial purposes.	ILO2	**CO 2: Classify** various fuels and polymers based on theirproperties and processing methods to access the industrial applications and environmental impact.
CO3	**Explain** the general properties of polymers and fuels.	IOL3	**CO 3: Interpret** the spectral data to understand the compositionof compounds
CO4	**Interpret** the spectral data to with its industrialapplications.	ILO4	**CO 4: Create** the suitable method forthe treatment of given watersample for industrial and domestic purpose.

B. Physics Course Outcome

TABLE 3

	COs with LOTS		Reframed to ILOs with HOTS
CO1	**Explain** the concepts of Quantum Physics in describingparticle at micro state.	ILO1	**Distinguish** the concepts of Quantum Physics in describingparticle at micro state and macro state.
CO2	**Understand** the working mechanism and characteristicsof semiconductor optoelectronic devices.	ILO2	**Design** the working mechanism and characteristics of semiconductor optoelectronic devices.
CO3	**Explore** the characteristics of lasers & optical fibres and their applications in various sectors by using the conceptsof wave optics.	IOL3	**Analyse** the characteristics of lasers & optical fibres and theirapplications in various sectors by he concepts of wave optics.
CO4	**Apply** the properties of dielectric, magnetic and Nanomaterials in diver's fields of applications.	ILO4	**Apply** the properties of dielectric, magnetic and Nano materialsin diver's fields of applications.

III. The Target Participants

The freshman engineering program at the institute encompasses four branches, divided into two Non-ET and two ET branches. The curriculum for Non-ET branches includes Chemistry, while ET branches feature Physics. To enhance student learning, course-level projects were made mandatory for these subjects. Subject mentors were assigned to supervise and guide students in their respective projects, ensuring a branch-specific learning experience. This approach allows students to apply theoretical concepts to practical problems, fostering a deeper understanding of their chosen field (Prince & Felder, 2006)

TABLE 4

Description of the participants

Branch	Branch & Section	Number of Students	Guide	
			Subject Internal Gude	Core Faculty Guide
E.T. (Engineering Technology)	Data Science (CSD A)	60	1	1
	Data Science (CSD B)	57	1	1
	Data Science (CSD C)	58	1	1
	Artificial Intelligence and Machine Learning (AI&ML A)	59	1	1
	Artificial Intelligence and Machine Learning (AI&ML	57	1	1
Non-E.T. (Non-Emerging Technology)	Computer Science Engineering (CSE A)	57	1	1
	Computer Science Engineering (CSE B)	54	1	1
	Computer Science Engineering (CSE C)	56	1	1
	Electronics Communication Engineering (ECE)	60	1	1
No of Students, Faculty and Industry Mentors				
Students		518		
Internal Subject Faculty Guide		09		
Core Faculty Guide		09		
External expert		02		

This innovative study diverges from conventional models by incorporating Course-Level Projects (CLPs) into the first-year curriculum, thereby enabling students to apply theoretical concepts to authentic engineering problems within specific courses. Unlike traditional approaches that prioritize theoretical foundations, this methodology introduces hands-on, real-world projects from the outset, providing students with practical experience from the beginning of their academic journey (Dabbagh & Kitsantas, 2012). Additionally, the study features ongoing guidance from both faculty members and industry experts, further enriching students' practical skills and industry preparedness (Strobel & van Barneveld, 2009).

This study seeks to address two primary research questions:

1. How do Course-Level Projects (CLPs) bridge the gap between industry and academia for first-year engineering students?
2. How do CLPs prepare students for effective participation in Project-Based Learning (PBL) in later years?

IV. Methodology

At HITAM, first-year engineering students take Physics as a foundational science course for Emerging Technology (ET) programs, while Chemistry serves as the foundational course for Non-Emerging Technology (Non-ET) programs. To enrich the educational experience, Course-Level Projects (CLPs) have been incorporated as a mandatory component of these courses. The 16-week semester schedule seamlessly integrates CLP sessions alongside regular lecture hours, allowing students to apply theoretical concepts to practical projects and fostering a more immersive learning environment (Prince & Felder, 2006).

On Indian National Science Day, students had the opportunity to showcase their project presentations at the EXPO, conveniently timed after the 15-week Course-Level Project (CLP) period. The capstone presentations were evaluated by a panel of four judges, comprising two internal judges and two external industry experts, who brought their expertise to assess the students' work during the EXPO (Coyle, Jamieson, & Oakes, 2005).

The qualitative interviews with the panel members employed a structured and systematic cross-sectional approach, allowing for the collection of rich and comprehensive data at a single point in time. This methodology ensured that the data was gathered in an efficient, organized, and thorough manner, providing a snapshot of the panel members' perspectives and insights (Creswell, 2014).

V. Data Collection

In this research, we followed Kvale's method, which ishighly regarded for its depth and flexibility, allowing for comprehensive exploration of participants' perspectives through open-ended questions. It excels in eliciting detailed

TABLE 5
Comprehensive 16-week schedule for the CLP conduction, detailing the activities and roles of guides

Week	Activities	Subject Internal Guide	Core Faculty Guide (Guide from the specific branch)
1	Introduction to CLP, Formation of groups, Selection of topics	Introduce CLP objectives and expectations, assist in group formation	Provide industry insights, suggest relevant topics
2	Initial Research and Proposal Submission	Guide initial research, help refine project proposals	Validate proposals, ensure industry relevance
3	Literature Review and Research Planning	Assist in literature review, plan research methodology	Offer resources for literature review, suggest methodologies
4	Defining Project Scope and Objectives	Help define project scope, set clear objectives	Align objectives with industry needs
5	Detailed Project Planning and Resource Allocation	Guide detailed planning, allocate necessary resources	Suggest additional resources, validate plans
6	Project Design and Development Phase 1	Oversee design phase, ensure adherence to objectives	Provide technical insights, validate design approach
7	Project Development Phase 2	Continue overseeing development, address any arising issues	Offer advanced technical support, ensure practical applicability
8	Mid-Term Review and Feedback	Conduct mid-term review, provide feedback	Participate in review, give industry-based feedback
9	Implementation Phase 1	Oversee initial implementation, ensure progress	Validate implementation, ensure alignment with industry practices
10	Implementation Phase 2	Continue overseeing implementation, troubleshoot problems	Provide advanced implementation techniques, validate progress
11	Testing	Guide testing phase, help in correcting	Ensure testing meets industry standards, assist in troubleshooting
12	Final Adjustments and Preparations for Presentation	Assist in final adjustments, prepare for presentations	Validate final adjustments, offer presentation tips
13	Final Presentation Preparation	Conduct mock presentations, provide constructive feedback	Attend mock presentations, offer professional presentation advice
14	Project Submission and Presentation	Oversee final submission, assess presentations	Evaluate presentations, ensure industry relevance
15	Post-Project Review and Feedback	Conduct post-project review, collect feedback	Participate in review, provide comprehensive industry feedback
16	Reflection and Documentation	Guide reflection on learnings, assist in documentation	Ensure documentation quality, align with industry standards

refined responses and adapting to the flow of conversation, making it particularly effective (Kvale, 2007).

We selected students who participated in the EXPO by random selection methods and two internal faculty and two industrial experts. A survey questionnaire was constructed, and face validation was performed. Face validity is merely a subjective, superficial assessment of whether the measurement procedure used in the study appears to be a valid measure of a given variable. The questionnaire framed meets SMART (Specific, Measurable, Attainable, Realistic, and Timely) guidelines. Framing survey questions and targeting different groups of students enables better understanding of results (Raja & Abirami, 2017).

A. Face Validity

A team of five faculty and five students were selected as the pilot participants to assess the relevance, clarity, and appropriateness of the dimensions of the survey instrument and the associated items in each dimension. The participants were informed about the one-to-one interview through phone calls and were invited with fixed timings through email. They were clearly explained the purpose of the survey and how the data would be used. The questionnaire was floated through email and WhatsApp along with the guidelines of the questionnaire to review or prepare responses. This constituted the evidence for the face validity of the instrument. After the interview, the participants were asked about their interpretation of each question and whether they found any questions confusing. It was completely ensured that questions were designed to respect participants' privacy and confidentiality by explaining that participation was voluntary and that participants could withdraw at any time. Participants were provided with a clear and concise explanation of the purpose of the survey, how their data would be used, and how their privacy would be protected. The feedback received from this team did not suggest any changes, and hence the instrument was administered as proposed (Drost, 2011).

TABLE 6
Survey Questionnaire

For Students	For Panel Judges
Which CLP did you find most engaging, and why? What did you learn from it?	From your perspective, how well do Course-Level Projects (CLPs) align with current industry practices? Can you provide an example?
How did a specific CLP help you understand your physics or chemistry course better?	How effective are CLPs in bridging the gap between theoretical knowledge and practical application in engineering education?
What skills did you gain from CLPs that you think will help you in future PBL projects?	What aspects of CLPs do you believe are most beneficial for preparing students for interdisciplinary Project-Based Learning (PBL)?
What were the biggest challenges you faced in your CLP, and how did you overcome them?	What challenges have you observed in integrating CLPs into the freshman curriculum, and how can these be addressed?
How did feedback from faculty or mentors impact your CLP work? Can you give an example?	Can you describe a specific instance where a CLP demonstrated significant real-world relevance or industry application?
How did your CLP experience prepare you for team projects in PBL? Can you provide an example?	How does the feedback provided during CLPs influence students' readiness for future PBL assignments? Can you give an example?
How did working with your team during the CLP help improve your teamwork and communication skills?	In your view, what are the strengths and weaknesses of the CLP approach in fostering essential skills such as problem-solving and teamwork?
How did the structure of your CLP affect your problem-solving approach? What was challenging or rewarding?	How well do CLPs prepare students for the collaborative and complex nature of PBL projects? What improvements could be made?
What parts of your CLP helped connect theoretical knowledge with practical work?	What role should industry experts play in designing and implementing CLPs to ensure they meet industry standards and needs?
If you could change one thing about your CLP to better prepare students for PBL, what would it be?	If you could suggest one major change to enhance the effectiveness of CLPs in preparing students for PBL, what would it be and why?

B. Survey Execution

After validating the survey questionnaire, it was administered to the selected participants, which includednine students. The students were selected by random selection method using a tool called “Random.org”, which helped in selecting the students without human bias, two internal faculty members, and two industrial experts. The execution followed the same procedure as the pilot test, as nochanges were deemed necessary for the instrument.

The interviews commenced the day after the INSD event and were completed over a period of two days, where students showcased their projects at the EXPO. Each participant was invited to the interview via email and WhatsApp, with separate time slots allocated for each. Interviews were conducted in the conference room of the institution. All participants engaged in one-on-one interviews. The two industrial experts participated through an online Zoom meeting, for which they received the meeting link via email and WhatsApp. All the offline and online interviews were recorded with their consent, and key points and insights during the interview were noted down. Self-observation points were also noted down. To convert the audio to text, Otter.ai transcription tools were used. Data cleaning was done to remove irrelevant information, and all data was uniformly formatted for analysis (King & Horrocks, 2010).

C. Data Analysis

The data is coded by organizing it into different categories based on similar features and concepts. A three-phase data coding method was incorporated (Kittur, 2024):

Phase One: The initial review of the qualitative data, known as open coding, involved coding everything that is important, categorizing words, sentences, or entire passages based on their significance. Manual coding was done by giving different colors to the data. (Javeed Kittur,2024)

Phase Two: In the second review, there was a chance to code anything missed earlier and to update existing codes. This round provided a clearer understanding of the data, allowing for better coding and pattern identification. To address researcher biases, a second coder reviewed and coded the data as well. The codes from both reviewers were compared, and any differences were resolved through discussion.

Phase Three: In the third phase, the previously generated codes were sorted and combined to identify categories, patterns, or themes in the data. Codes with similar meanings were grouped together with the same color. Observations and supporting documents were then used to further support the findings from the interview data. (Javeed Kittur,2024)

TABLE 7
Final codes developed after three phase coding analysis

Question	Code	Color
1. How do Course-Level Projects (CLPs) bridge the gap between industry and academia for first-year engineering students?	Industry-Academia Bridge	Yellow
	Practical Application	Light Blue
	Industry-Relevant Skills	Green
	Real-World Experience	Orange
2. How do CLPs prepare students for effective participation in Project-Based Learning (PBL) in later years?	Preparation for PBL	Purple
	Skill Development	Pink
	Teamwork and Collaboration	Red
	Understanding Project Dynamics	Teal

VI. RESULTS

In this section, we present the findings of our research study on the impact of Course-Level Projects (CLPs) on bridging the gap between industry and academia, and preparing students for Project-Based Learning (PBL). The research questions involved were:

How do Course-Level Projects (CLPs) bridge the gap between industry and academia?

How do CLPs prepare students for Project-Based Learning (PBL)?

The study utilized a qualitative research approach, involving thematic analysis of responses from students, faculty, and industry experts. The data was collected through interviews and questionnaires, coded in three phases to identify key themes and insights. We interpreted the data and explained how we arrived at particular conclusions.

The findings of the survey questionnaire are analyzed and reported.

TABLE 8
Summary of the findings of survey Instrument

Item	Students' Perspective	Faculty's Perspective	Industry Experts' Perspective
Industry-Academia Bridge	Exposure to real-world industry practices; helped in grasping tangible concepts by linking theory to practice	Ensured alignment of curriculum with evolving industry standards; improved relevance of course material.	Equips students with skills directly relevant to the job market, ensuring they are industry-ready upon graduation
Practical Application	Application of theoretical knowledge to solve practical problems increased their engagement with the subject.	Enhanced student engagement and deeper understanding of subject matter through real-world applications.	Provided hands-on experience, which highly valued and expected in the industry for future professionals.
Industry-Relevant Skills	Developed critical problem-solving and technical skills needed to meet industry expectations.	Focused on the development of skills that are highly valued by employers, including technical proficiency.	Seen as vital for students' readiness to enter the workforce with the necessary competencies.
Real-World Experience	Valued opportunities to engage with real-world industry challenges that simulated future work environments.	Provided students with practical exposure, linking theoretical learning with real-world applications.	Prepared students to face real-life industry scenarios and challenges, making them workforce-ready.
Preparation for PBL	Helped lay the groundwork for future Project-Based Learning (PBL) by building confidence and foundational skills.	Increased student readiness for tackling more complex, interdisciplinary projects in PBL environments.	Prepares students for interdisciplinary collaboration, which is essential in modern industry projects.
Skill Development	Significant development in research, management, and technical skills through practical engagements.	Marked improvement in students' practical skills and their ability to apply theoretical knowledge.	Considered critical by industry experts these skills are essential for tackling real-world challenges.
Teamwork and Collaboration	Improved communication and collaboration with peers, preparing them for team-based industry work.	Fostered better collaboration among students, enhancing group work dynamics essential for PBL success.	Emphasizes the importance of teamwork in industry, where most projects require effective team-based collaboration.
Understanding Project Dynamics	Gained insights into project management, including time management and leadership skills.	Better understanding of how students perceive and manage projects; improved ability to guide student projects.	Valuable for ensuring students comprehend project dynamics, such as timelines, deliverables, and leadership.

VII. Conclusion

The study demonstrates that Course-Level Projects (CLPs) effectively bridge the gap between industry and academia by aligning academic learning with industry standards and providing valuable real-world experience (Coyle, Jamieson, & Oakes, 2005). CLPs prepare students for Project-Based Learning (PBL) by building foundational skills such as research, project management, and teamwork (Dabbagh & Kitsantas, 2012). The shift from Lower Order Thinking Skills (LOTS) to Higher Order Thinking Skills (HOTS) in CLPs significantly enhances application skills. This transition helps students apply theoretical knowledge in innovative ways and improves their readiness for complex projects. By fostering HOTS, CLPs better equip students for the demands of both PBL and professional careers, ensuring they meet industry expectations and are prepared for future challenges (Prince & Felder, 2006)..

VIII. Future Scope

In the future, we can explore the long-term impact of CLPs on students' career progression and industry readiness. It would be beneficial to investigate how different types of CLPs influence specific skill sets and their effectiveness in various engineering disciplines. Expanding the study to include a larger and more diverse sample of students and institutions could provide broader insights. Additionally, examining the integration of industry feedback into CLP design could further enhance relevance. Evaluating the transition from CLPs to full PBL frameworks in subsequent academic years would provide valuable data on the effectiveness of this phased approach. Longitudinal studies could track the development of HOTS over time and their influence on students' professional success (Javeed Kittur, 2024).

The list of few projects that students have exhibited on the INSD are included as an Appendix.

APPENDIX

S No	Roll No	Name of student	Branch	Title of Project
1	**23E51A67F8**	Yeshwanth	CSD A	Potable water treatment
	23E51A67F7	Adithya		
	23E51A67D8	praveen		
	23E51A67F0	karthik		
2	23E51A67F3	Hari kishan	CSD A	Reverse osmosis
	23E51A67F5	Sai priya		
	23E51A67D5	Ayush		
	23E51A67E9	Chetan		
3	**23E51A67E6**	Ravi Shankar	CSD A	Waste Management
	23E51A67E0	Jaffar		
	23E51A67D3	Srinath		
	23E51A67E7	Vishnu		
4	**23E51A67E1**	Harshita	CSD A	Moisture Detector
	23E51A67E2	Abdul rehman		
	23E51A67D7	Urmitha		
	23E51A67D9	Naveen Naidu		
5	23E51A67E5	Srujana	CSD A	Turn dry leaves into soil conditioner
	23E51A67D4	Ameena		
	23E51A67D0	Rajesh		
	23E51A67C9	Sreeram		
6	23E51A6682	Yoshitha pranavi	AI& ML	Anaerobic Gaslift Reactor (AGR) for the generation of biomanure from organic waste
	23E51A66B1	Sindhuja		
	23E51A66A0	Vivek		
	23E51A66C4	Pranay		
7	23E51A6686	H.Rohan	AI& ML	Automatic Fire Alarm, by using pyro electric sensor
	23E51A66B5	V.Roopa		
	23E51A66A1	G.Uday		
	23E51A66B0	B.Rajesh		
8	23E51A6692	D.Reetvi	AI& ML	Potable water filter
	23E51A66C0	E.Naga santosh		
	23E51A66A2	T.Mokishitha		
	23E51A66B6	Kalyan		
9	23E51A66A4	K.sai shanshak	AI& ML	Synthesis of water from moisture
	23E51A66C2	Kranthi		
	23E51A66A3	Likith		
	23E51A66C1	Jai vardan		
10	23E51A66A7	B Maruthi	AI& ML	Solar energy Tracker
	23E51A66C8	MVK Satvika		
	23E51A66B2	E Sharoni		
	23E51A66B9	Ch Prabhu		
11	23E51A66C6	vaishnavi	AI& ML	Magnetic Field Detector
	23E51A66A6	S.shirisha		
	23E51A6696	V.Manasa		
	23E51A66A8	Kiran		

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