

Effectiveness of a PBL Curriculum in Preparing Electrical Engineering Students for Industry through SSDC

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Abstract—In recent days, conventional learning method moving towards the research methodology which approaches to develop industry-relevant curriculum in engineering education that involves Project-based learning. Research question is how SSDC enhances the student skills and how does it meet the demands of current industry? The effectiveness of the course can be improved by designing the course of study by make use of various learning's through projects associated with academics. Researchers commended the need to develop competency models for each occupation or job, so as to define graduated students' successful performance in a particular area of work through their technical knowledge to reach industry competencies. This represents the enhancing in traditional method research by implementing various Project-based learning strategies in inclusion to academics as per the industrial stipulation through Student Skill Development Center.

Keywords—Academic-Industry, Project-Based Learning, Student Skill Development Centre, Real world Engineering.

I. INTRODUCTION

In order to bridge the knowledge gap between academics and industry demands, the Student Skill Development Center (SSDC) has implemented a Project-Based Learning (PBL) curriculum. This is a major leap in engineering education. The goal of the SSDC is to provide students studying electrical engineering with a broad range of competencies necessary for contemporary engineering practice, including as technical expertise, problem-solving skills, teamwork, communication, and critical thinking. These skills are essential for dealing with modern engineering problems and succeeding in a fast-paced work setting. Through the integration of flexible course design, industry partnerships, and real-world projects, the PBL method within the SSDC involves students in active learning experiences that extend beyond standard classroom education. Students increase their design skills, learn how to work well in teams, and build critical thinking and problem-solving abilities through practical projects and real-world applications. These

experiences are intended to simulate the difficulties and situations that they would face in their professional lives, giving them a useful and applicable education.

Industry collaborations are essential to the SSDC's PBL program. The center guarantees that the curriculum stays in line with current industry requirements and needs by working with leaders in the field. Through these collaborations, students can work on projects with practical applications, utilize hardware and software pertinent to the business, and

learn about the newest developments in technology. Students are better equipped to move smoothly from academic settings to professional situations thanks to this direct exposure to industry norms and expectations. The development of a curriculum that covers the particular abilities and technologies that the electrical and electronics engineering sector is currently in need of is a crucial part of the SSDC's strategy. The SSDC guarantees that graduates are not just competent in their technical knowledge but also confident in their ability to apply this knowledge in real-world situations by emphasizing in-demand abilities. This focused strategy improves graduates' employability and readiness by addressing the skills gap that is frequently seen between academic training and industry requirements. In addition, the PBL program encourages a lifetime learning culture. The capacity to adapt and pick up new skills is becoming more and more crucial as the engineering landscape changes. Students are encouraged to maintain current technology knowledge and skills by the SSDC, which instills this mindset in them. This dedication to lifelong learning guarantees that graduates will, in the long run, be competitive and relevant in their careers. The PBL program emphasizes communication skills significantly in addition to technical skills. Students are encouraged to give presentations of their research and projects, which helps them become more proficient at successfully and clearly communicating complicated technical material. Having this ability is crucial for success in the workplace because engineers frequently work with stakeholders, clients, and other colleagues who may not be technical experts. The way that the

PBL curriculum at the SSDC prepares students majoring in electrical engineering for the workforce. It will look at how the curriculum improves students' professional preparedness, practical skills, and alignment with market expectations. This study aims to offer insights into the advantages and possible areas for development in using PBL to prepare students for successful engineering careers by analyzing the results of the SSDC's approach. With the integration of PBL in SSDC in the view of Training's, development of projects and Certifications which aims to meet the current industries.

II. LITERATURE SURVEY

[María]-José Terrón-López et al, Project-Based Learning as an Experiential Pedagogical Methodology in Engineering: This paper investigates how PBL improves students' practical skills in engineering education. It draws attention to the difficulties and advantages of PBL, emphasizing professional settings, global perspective, sustainability, and technological integration.

[Khatsrinova], O., Barabanova, S., Khatsrinova, J, Project-Based Learning Activities for Engineering College Students: This paper discusses the role of university teachers in systemic changes in engineering education through PBL, emphasizing the development of elite training programs and the integration of PBL in fostering essential engineering competencies.

[Bucciarelli], L. L., Burch, V. C., Sikakana, C. N., Yeld, N., Seggie, J. L., & Schmidt, H. G., Problem-Based and Project-Based Learning in Engineering Education, This paper compares problem-based learning (PBL) and project-based learning, focusing on their impact on engineering education. It examines how these methods enhance students' performance, motivation, and ability to tackle real-world problem.

[J. E. Mill], D.F. Treagust, Impact of Project-Based Learning on Students' Achievement in the Electrical Engineering Laboratory Course: The study evaluates the effectiveness of PBL in an electrical engineering laboratory course. It reports improved academic performance and engagement among students, as well as enhanced technical and non-technical skills.

[S. V. Matveeva], The Role of Project-Based Learning in Engineering Education: Enhancing Students' Professional Skills: This paper discusses the benefits of PBL in engineering education, focusing on how it helps students develop professional skills such as teamwork, communication, and critical thinking, which are crucial for their future careers.

[Komarova], I.V., Rubaknina, S.G. Developing Engineering Students' Competencies through Project-Based Learning: The paper explores how PBL helps engineering students acquire essential competencies, including technical knowledge, problem-solving abilities, and collaborative skills, through real-world projects.

[Shageeva], F.T., Galikhanov, M.F., Strekalova, G.R. Entrepreneurial Competencies of Engineering Students through Project-Based Learning: This paper examines how PBL fosters entrepreneurial competencies in engineering students, preparing them for successful careers in the global business environment.

[Valeeva], R., Ziyatdinova, J., Osipov, P., Oleynikova, Evaluation of Project-Based Learning in Engineering Education: Student Perspectives: This paper assesses students' perceptions of PBL in engineering education, highlighting the positive impact on their motivation, engagement, and readiness for professional challenges.

Tarasova, E.N., Khatsrinova, O.Y., Galikhanov, Implementing Project-Based Learning in Electrical Engineering: Challenges and Successes: This paper discusses the challenges and successes of implementing PBL in electrical engineering programs, emphasizing the importance of industry partnerships and hands-on experience in preparing students for the workforce.

[Carter], J., Eriksen, K., Horst, S., & Troelsen, Enhancing Electrical Engineering Education through Project-Based Learning: The research demonstrates how project-based learning (PBL) improves electrical engineering education by giving students the chance to work on projects that are relevant to the industry, which increases their employability and technical proficiency.

Through the literature survey, it clearly explains how Project Based Learning prepare Electrical Engineering Students for the industry by improving their technical and practical skills through real time applications and industry collaboration. This survey will helps the study to analyze the impact of Project based learning in their future by enhancing their communication skills, Problem solving skills in real time. Also, This survey reduces the gap between Academics and the industries.

III. METHODOLOGY

Implementing a Project-Based Learning (PBL) in the Student Skill Development Centre (SSDC) provides a comprehensive approach to education by fusing academic knowledge with real-world application. SSDC trains the students in the technical, teamwork, communication, critical thinking, and problem-solving abilities necessary to meet difficulties in the real world. Through the incorporation of adaptable courses, industry partnerships, and practical projects, students participate in an active learning process that improves their design skills. So, in this context, PBL is a fundamental methodology that prepares students for future career paths and promotes an innovative culture by involving them in meaningful projects that enhance creativity and teamwork.

Phase 1: In this phase, we train students on PLC & Arduino. Programming: Ladder diagrams, Arduino IDE

Conduction procedure: Its complete hands on session. Where faculty will act like facilitator, its completely interactive training sessions where students work in group to complete given task and by combining task they will design projects.

Phase 2: In this phase we train students on Projects & Research Papers. In this phase we started with introduction to automation by doing projects, how to monitor and control a plant or equipment in industries.

Under Qualitative and Quantitative approach, Pre, Post-Assessment and Surveys are conducted. Pre and post-assessments are important tools (Google forms) for assessing the effectiveness of Project-Based Learning (PBL) at SSDC. Pre-assessment test conducted for the Second and Third year students involves gauging students' prior knowledge, skills, and attitudes before the training begins, through quizzes and surveys. Students provided their feedback and areas in improvement. This helps identify existing gaps and modify the project to meet for better students' needs. Post-assessment, conducted after completion of the training program, measures the learning outcomes and changes in students' knowledge, skills, and attitudes. This approach helps in the status of the training program and also provides important feedback for upcoming classes and Certification Programms. Surveys will be conducted for the students before and after completion of the training program to test the student's knowledge in regards to critical skills and exploring the courses.

IV. RESULTS AND DISCUSSION

Are you Interested to be part of SSDC EEE Core Team

11 responses

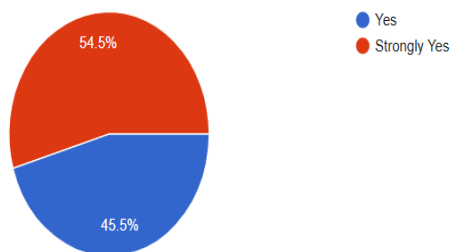


Fig.4.1. Interested Students to be a part of SSDC Core Team

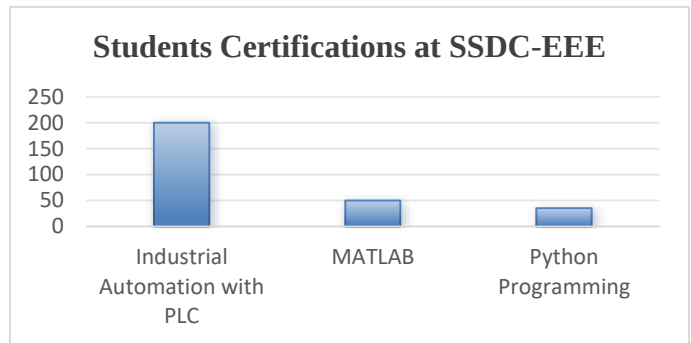


Fig.4.2. Students Certifications for various Training Programms

As Per 4.1. Students Interest to be a part of SSDC Core team as they are responsible to conduct workshops or any event conducted by the SSDC as a Student Volunteers. As per the figure, students are very responsible to be a part of core team. As per 4.2. Students completed the certifications for the courses Industrial Automation with PLC, MATLAB and Python Programming at SSDC EEE till 2024 which are related to the industries. As per the 4.3. Students Feedback for the academic year 2023-24, Students are very active in the classes to learn the new courses which are not belong their academics.

Give the Rating of SSDC EEE for the academic year (2023-24)

11 responses

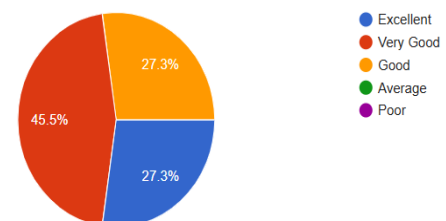


Fig.4.3. Students Feedback for academic Year 2023-24

Research Question: How SSDC enhances the student skills and how does it meet the demands of current industry?

SSDC EEE establishes to bridge the gap between the industries and academics, so by introducing new courses, students are able to learn and do the projects beyond the curriculum, which are useful to meet the current industry.

According to Komarova, I.V., Rubaknina, S.G. Developing Engineering Students' Competencies through Project-Based Learning, Bucciarelli, L. L., Burch, V. C., Sikakana, C. N., Yeld, N., Seggie, J. L., & Schmidt, H. G., Problem-Based and Project-Based Learning in Engineering Education and Carter, J., Eriksen, K., Horst, S., & Troelsen, Enhancing Electrical Engineering Education through Project-Based Learning, students should learn the critical thinking skills and problem solving skills to empower themselves to work in the industries. Similarly, at SSDC EEE, students will enhance critical thinking skills for proper problem identification, collaborative skills while working with team and Problem solving skills to solve the complex issues through Certification

Programme and Projects which are useful to meet the current industry.

CONCLUSION

As Conventional learning method is not sufficient for the industry requirements, also the research work is day by day enhancing towards the more innovations from the graduation level i.e., through project-based learning which means projects should create in the college level which is useful for the society and for industries. So, to meet up the industry needs, curriculum can be modified according to the new technology like by integrating SSDC in academics which implies a quick solution for a complex problem in the respective field. So, research should include in their academics to enhance the updated technologies in their respective field. With these changes in Engineering Education, industries will hire the students as per their requirement by collaborating with the colleges and gap will reduce completely in future from traditional approach to real time applications.

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