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Innovative learning through lesson study for learning community (LSLC) in the manufacturing process course

Irfan Santosa [1,*], ***Agus Wibowo*** [1], ***Ahmad Farid*** [1], ***Galuh Rengganis Wilis*** [1], ***Sunardi Sunardi*** [2], ***Dicnanda Wildan Saputra*** [3]

[1] *Department of Mechanical Engineering, Faculty of Engineering, Universitas Pancasakti Tegal, Jl. Halmahera KM 1 Tegal 52121 Indonesia*
[2] *Department of Mechanical Engineering, Faculty of Engineering, Universitas Sultan Ageng Tirtayasa, Jl. Jend. Sudirman KM 3 Cilegon 42435 Indonesia*
[3] *PT. Barata Indonesia, Jl. Pemuda, Mintaragen, Kec. Tegal Timur 52111 Indonesia*
[*] *E-mail: irfansantosa@upstegal.ac.id*

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ABSTRACT

Community Service Activities are designed to provide innovative and engaging educational experiences that align with the broader goals of teaching and learning in higher education. One such initiative is implemented through the Lesson Study for Learning Community (LSLC) model in collaboration with PT. Barata Indonesia, aiming to bridge the gap between theoretical instruction and the practical demands of the professional world. This community service program focuses specifically on the Manufacturing Process course, with a thematic emphasis on metal coating. The primary participants are 55 fourth-semester students enrolled in the 2024/2025 academic year. A qualitative approach is used to evaluate the enhancement of students' knowledge and competencies. The findings indicate a high level of enthusiasm among students, with a 90% increase in understanding of metal coating concepts. Furthermore, students' practical competencies were significantly strengthened through direct hands-on experience at PT. Barata Indonesia.

ABSTRAK

Kegiatan Pengabdian Masyarakat dirancang untuk memberikan pengalaman pendidikan yang inovatif dan menarik yang sejalan dengan tujuan pengajaran dan pembelajaran yang lebih luas di pendidikan tinggi. Salah satu inisiatif tersebut dilaksanakan melalui model Lesson Study for Learning Community (LSLC) bekerja sama dengan PT. Barata Indonesia, yang bertujuan untuk menjembatani kesenjangan antara instruksi teoritis dan tuntutan praktis dunia profesional. Program pengabdian masyarakat ini berfokus secara khusus pada kursus Proses Manufaktur, dengan penekanan tematik pada pelapisan logam. Peserta utama adalah 55 mahasiswa semester empat yang terdaftar pada tahun akademik 2024/2025. Pendekatan kualitatif digunakan untuk mengevaluasi peningkatan pengetahuan dan kompetensi mahasiswa. Temuan menunjukkan tingkat antusiasme yang tinggi di antara mahasiswa, dengan peningkatan 90% dalam pemahaman konsep pelapisan logam. Selain itu, kompetensi praktis mahasiswa diperkuat secara signifikan melalui pengalaman langsung di PT. Barata Indonesia.

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1. Introduction

Innovative learning strategies through the Lesson Study for Learning Community (LSLC) model have been effectively integrated into the Manufacturing Process Course, emphasizing collaborative teaching to enhance both lecturer performance and student involvement. This approach combines Project-Based Learning (PBL) and the use of modern technology to create a dynamic and engaging classroom environment [1-2]. As a form of continuous professional development, lesson study fosters collaboration among educators and supports the formation of learning communities where students can engage deeply with complex materia [3]. Group discussions within these communities are shown to significantly increase students' understanding. Similarly, the Sharing and Knowing (SHARK) learning model contributes to improved learning outcomes through its structured, clear, and enjoyable methodology [4].

Unlike conventional lecturer-centered methods, LSLC emphasizes learner-centered and socially collaborative experiences. Its implementation in Biology Education has led to remarkable improvements in student comprehension, rising from 11.25% to 70.50% [5]. The LSLC cycle consists of three iterative stages: planning, doing, and seeing, which, when applied consistently, lead to sustainable improvements in educational quality [3, 6]. The effectiveness of learning communities is closely tied to proper planning and supervision. Such communities thrive when they foster meaningful engagement and comprehension of learning materials [7-8]. In the context of the Manufacturing Process course, active student participation builds retention and encourages teamwork, while collaboration among lecturers and support teams enhances teaching strategies [9].

Collaborative learning becomes more impactful when it involves not only educators but also industry practitioners [10]. The inclusion of practitioners enhances students' motivation and serves as a bridge between theoretical instruction and real-world applications [11]. However, the success of these initiatives depends on four critical factors: (1) consistent communication and socialization, (2) adequate human and infrastructural resources, (3) commitment from policy stakeholders, and (4) an organized and supportive administrative system [12]. Given the practical nature of the Manufacturing Process course, students must develop both theoretical insight and hands-on skills with industry-standard machinery and tools [13]. This dual focus not only builds competence but also encourages entrepreneurial thinking [14]. While there are challenges in integrating practitioners into university teaching—especially concerning alignment with curriculum and learning outcomes—their involvement offers a promising solution to the resource limitations commonly faced by higher education institutions [15].

2. Method

As part of this community service initiative, the Mechanical Engineering Study Program at Pancasakti University, Tegal implemented a structured series of stages aimed at aligning academic learning with industrial practices. The stages were as follows:

1. Collaborative Planning: Lecturers partnered with practitioners from PT. Barata Indonesia, Kota Tegal, to jointly design an integrated learning model that included both in-class instruction and hands-on industrial training.
2. Program Synchronization and Implementation: Detailed technical preparations were undertaken to synchronize the academic and industrial components, ensuring the smooth execution of the teaching and learning process. This stage also included designing an appropriate assessment mechanism.
3. Sustainability Recommendations: Based on the outcomes and evaluations, strategic recommendations were formulated to ensure the long-term sustainability and scalability of the program.

To enhance clarity and efficiency in its implementation, the overall workflow of the community service program was visualized in a structured format, as depicted in Figure 1.

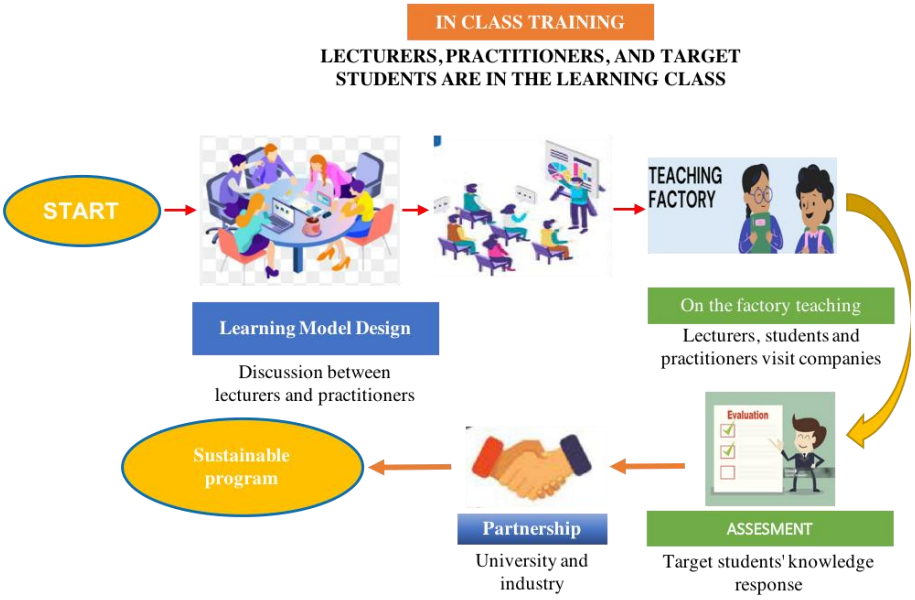

Figure 1. Flow chart for implementing community service programs.

3. Results and Discussion

This community service program is carried out in several stages, which are designed according to the previously explained implementation methods.

3.1. Designing a learning model.

In this activity, a team of lecturers collaborated with industry practitioners from PT Barata Indonesia in Tegal City to formulate, map, and analyze an innovative and engaging learning model. The lecturers proposed that industry practitioners deliver material on the topic of 'coating' (specifically, metal coating) as part of the Manufacturing Process course, which includes 55 students. The choice of this theme was based on local potential, considering the significant number of MSMEs in Tegal City that are involved in metal coating services. Additionally, PT. Barata Indonesia operates a coating workshop in Tegal City, as illustrated in Figure 2.

3.2. In-class training learning.

Following the initial stage of designing the learning model, the second stage focuses on implementing the In-Class Training learning model. During this phase, 55 students received foundational knowledge about corrosion, including its definition, mechanisms, environmental classifications according to ISO 12944-2, various models of corrosion protection, and the processes of initial inspection before, during, and after the coating application. Additionally, students were introduced to the auxiliary equipment used for analyzing corrosion on metals. The learning materials were provided to the students in file format. They then attended presentations delivered by practitioners in the field. At the end of the session, students completed a questionnaire that included questions related to metal coating. The process of the in-class training activity is illustrated in Figure 3.

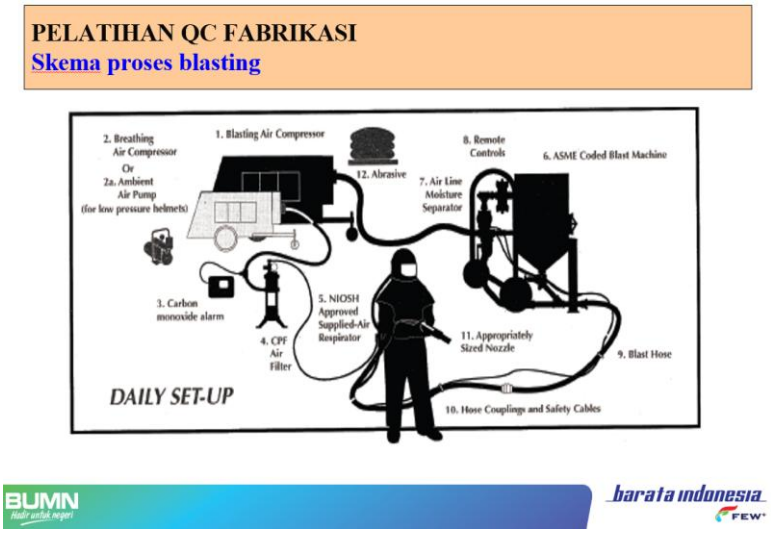

Figure 2. Scheme of the blasting workshop at PT. Barata Indonesia, Tegal City.

Figure 3. In-class training between practitioners and students.

3.3. On-the-factory teaching.

After completing the in-class training stage, students participate in a hands-on learning session in an industrial environment on the factory floor. This session takes place at PT Barata Indonesia in Tegal City, where students have the opportunity to directly observe the production process and explore the company's workshop facilities. Additionally, students engage in practical exercises related to the metal coating process and analyze the results of corrosion tests using the available equipment. Throughout this activity, students are required to wear personal protective equipment (PPE), including safety shoes, helmets, and vests. The entire learning process is guided by practitioners from PT Barata Indonesia in Tegal City, as illustrated in Figure 4.

Figure 4. On the factory teaching learning activities at PT Barata Indonesia, Tegal City

3.4. Evaluation of the teaching practitioner program.

The evaluation aims to assess students' knowledge and understanding of the material presented, particularly concerning the topic of 'coating.' This evaluation takes the form of a multiple-choice test consisting of five main questions: (1) understanding corrosion, (2) techniques for protecting materials against corrosion, (3) factors that influence the rate of corrosion in materials, (4) the definition of blasting, and (5) procedures for surface inspection before the blasting process. Each question offers four answer options (a, b, c, and d). The results of the students' responses are evaluated using a scoring system. Additionally, the evaluation data is visualized in a diagram, as depicted in Figure 5.

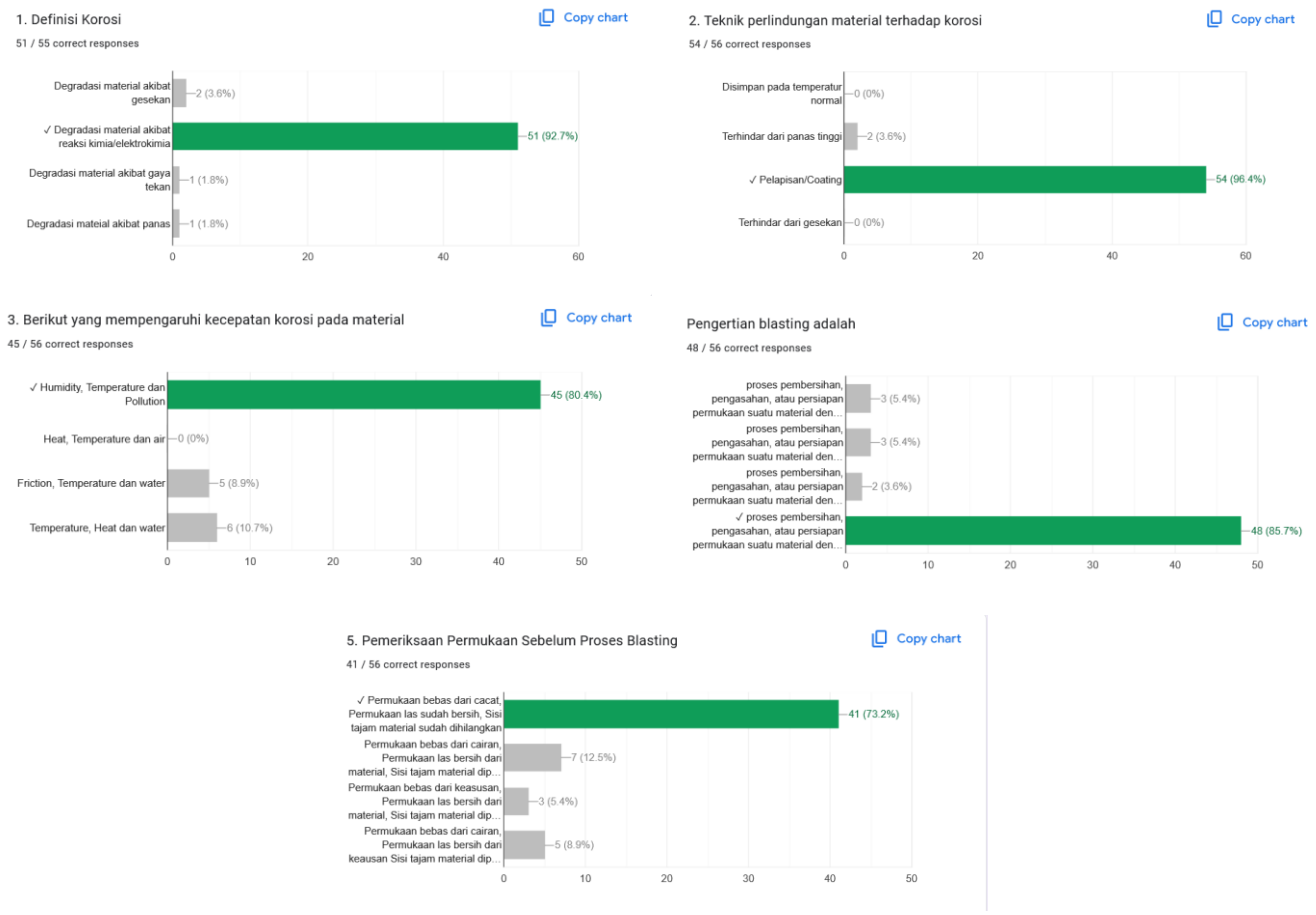

Figure 5. Student responses to questions about coating knowledge.

Figure 5 demonstrates a significant increase in students' knowledge related to the topic of coatings. In the first question, 51 students, or approximately 92.7%, provided correct and well-thought-out answers regarding the definition of corrosion, while only four students answered incorrectly. In the second question, 54 students (96.4%) answered correctly, with just one student responding incorrectly. For the third question, 45 students (80.4%) answered correctly, while 10 students provided less accurate answers. In the fourth question, 48 students (85.7%) answered correctly, whereas eight students answered incorrectly. Finally, in the fifth question, 41 students (73.2%) gave correct answers, while 15 students answered incorrectly. Overall, the average percentage of students' understanding of the coating theme reached 85.68%, indicating a good level of knowledge.

Figure 6. Photo taken at the conclusion of the program.

3.5. Provide recommendations for a sustainable program

After completing the technical stages of implementing the community service program, the next step involves PT. Barata Indonesia, in collaboration with the University, providing recommendations for a sustainable and ongoing program. The recommendations include:

1. Recruiting employees at PT Barata Indonesia in Kota Tegal from among university alumni.
2. Establishing a joint research program between the University and PT. Barata Indonesia in Kota Tegal.
3. Implementing a Sustainable Teaching Practitioner Program.

4. Conclusion

This community service activity demonstrates that innovative and enjoyable learning through the Lesson Study for Learning Community (LSLC) approach, in collaboration with PT. Barata Indonesia Kota Tegal, can effectively bridge the gap between university-level theoretical instruction and real-world industry needs. The learning model applied consists of two main approaches: in-class training and factory-based learning. During the in-class training, a total of 55 students received comprehensive knowledge on the fundamentals of corrosion, corrosion mechanisms, environmental classifications based on ISO 12944-2, various corrosion protection models, inspection procedures before, during, and after the coating process, and the use of auxiliary equipment for analyzing corrosion on metal materials.

In the factory-based learning component, students were given the opportunity to observe the production processes and workshop facilities at PT. Barata Indonesia. This hands-on experience provided contextual learning that reinforced their theoretical understanding through real-world applications. Based on the evaluation results, the average level of students' understanding and knowledge of the coating theme reached 85.68%, indicating that participants were able to grasp both theoretical and practical aspects of the material. Overall, this initiative successfully enhanced students' competencies in manufacturing processes—particularly metal coating—and strengthened the connection between academic education and industrial practice.

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REFERENCE

[1] Khotimah, K. (2025). Analisis Penerapan Pendidikan Berbasis Proyek untuk Mewujudkan Pendidikan Inklusi di Era Modern. *LEARNING : Jurnal Inovasi Penelitian Pendidikan dan Pembelajaran,* vol. 5, no. 1, pp. 74-82.

[2] Rahayu, B. M., Nuraini, H., Hidayat, S., & Asmawati, L. (2024). Integrasi Pengaplikasian Teknologi Dalam Pembelajaran Berbasis Proyek (Project-Based Learning). *JIPIS,* vol. 33, no. 1, pp. 55-62.

[3] Rini, A. P. (2021). Lesson Study for Learning Community (LSLC). *Jurnal Ilmu Agama Islam,* vol. 3, no. 1, pp. 25-38. https://doi.org/10.36269/tlm.v3i01.376.

[4] Juniar, D. T., Rohyana, A., & Rahmat, A. A. (2019). Pengembangan Model Pembelajaran Diskusi Kelompok dalam Meningkatkan Pemahaman dan Aktivitas Belajar Mahasiswa. *JUARA: Jurnal Olahraga*, vol. 4, no. 1, pp. 15-25.

[5] Marlina, R. (2018). Penerapan Lesson Study For Learning Community (LSLC) pada Mahasiswa Program Studi Pendidikan Biologi FKIP Universitas Tanjungpura. *Proceeding Biology Education Conference*, vol. 15, no. 1, pp. 598-605.

[6] Widayati, S. (2018). Implementasi Lesson Study pada Proses Pembelajaran Kajian Prosa Fiksi Mahasiswa Semester III STKIP Muhammadiyah Kotabumi Tahun Akademik 2017/2018. *Jurnal Elsa,* vol. 16, no. 1, pp. 1-10.

[7] Otto, S., Evins, M. A., Boyer-Pennington, M., & Brinthaupt, T. M. (2015). Learning Communities in Higher Education: Best Practices. *Journal of Student Success and Retention,* vol. 2, no. 1, pp. 1-20.

[8] Amirullah, A. H., & Iksan, Z. H. (2018). Lesson Study: An Approach to Increase the Competency of Out-of-Field Mathematics Teacher in Building the Students Conceptual Understanding in Learning Mathematics. *Journal of Educational Sciences*, vol. 2, no. 2, pp. 1-13.

[9] Burhanuddin, B., Muntari, M., Loka, I. N., Sofia, B. F. D., & Al Idrus, S. W. (2023). Pendampingan Penyusunan Perangkat Pembelajaran Berbasis Proyek Melalui Lesson Study. *Jurnal Pengabdian Inovasi Masyarakat Indonesia*, vol. 2, no. 1, 47–52. https://doi.org/10.29303/jpimi.v2i1.2288.

[10] Afriadi, F., Hidayah, M. F., & Gusmaneli. (2024). Pembelajaran Kolaboratif dalam Pendidikan Perguruan Tinggi. *IHSAN: Jurnal Pendidikan Islam*, vol. 2, no. 3, pp. 143-157.

[11] Suryana, S. (2024). Pengaruh Praktisi Mengajar Terhadap Peningkatan Motivasi Belajar Mahasiswa pada Mata Kuliah Pendidikan Konsumen. *Jurnal MediaTIK: Jurnal Media Pendidikan Teknik Informatika dan Komputer*, vol. 7, no. 2, pp. 114-117.

[12] Hazin, M., & Rahmawati, N. W. D. (2023). Implementation of Policy "Praktisi Mengajar" in Higher Education. *Journal of Education and Teaching Learning (JETL)*, vol. 5, no. 1, pp. 1-13.

[13] Setiono, A. T. (2015). *Kesesuaian Aplikasi Teknologi di UPT Logam, CV. Tunas Karya, dan PT. Dheawina Tekno sebagai Tempat Pelaksanaan Praktik Industri Mahasiswa Jurusan Pendidikan Teknik Mesin FT UNY*. Program Studi Pendidikan Teknik Mesin, UNY, Yogyakarta.

[14] Yuniani, K., Kardoyo, K., & Sakitri, W. (2017). Penanaman Jiwa Entrepreneurship Melalui Pembelajaran Praktik Manufaktur Furnitur. *Economic Education Analysis Journal*, vol. 6, no. 3, pp. 807-820.

[15] Lynch, P., Bober, C., & Wilck, J. (2015). Educating and Training the Next Generation of Industrial Engineers to Work in Manufacturing in *Conference: ASEE Annual Conference & Exposition*, Seattle, WA.