Seeing Growth Through Service Learning: My Journey with Separation Processes

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Abstract
This narrative inquiry explores the integration of service learning into the undergraduate Separation Processes course at the Faculty of Chemical and Energy Engineering, Universiti Teknologi Malaysia (UTM), from its inception in 2019 to its current implementation in 2024. Through personal reflection and pedagogical documentation, the paper traces the evolution of teaching practices, student engagement, and institutional response to service learning - a component now contributing 10% of the course's total assessment. Drawing from experiential learning theory, the study illustrates how service learning activities - ranging from school outreach programs and video production to public exhibitions - cultivate not only technical understanding but also communication, leadership, and organizational skills among chemical engineering students. The paper also reflects on the author's first year as course coordinator, revealing insights into curriculum management, staff development, and the broader impact of reflective practice in engineering education. By situating service learning within the scholarship of teaching and learning, the paper advocates for its continued growth as both a pedagogical tool and a catalyst for holistic student development.

Keywords: Service learning, chemical engineering education, experiential learning, narrative method

Introduction

It was 2003 when I first began teaching the course Separation Processes at the Faculty of Chemical and Energy Engineering, Universiti Teknologi Malaysia (UTM). I was then a young lecturer, fresh with passion and curiosity, eager to help students make sense of the complex operations that distinguish chemical engineering as both science and art. For years, I delivered the course through lectures, tutorials, and problem-solving activities. But something shifted in 2019. That year, prompted by the requirements of the Engineering Accreditation Council (EAC), we were asked to integrate service learning (SL) into our course delivery. It was an unfamiliar pedagogical turn, but one that would later define how I saw my students—and myself.

SL is an educational approach that supports university students in enhancing personal skills by engaging them in activities that foster civic engagement, strengthen their social and civic responsibility, and integrate academic learning with community service through structured programs addressing real-world needs to create meaningful environmental change (Rodríguez-Gallego, 2024). It was first just another activity required to be added as commanded by the department.

Now, in 2025, I find myself not just a lecturer but the course coordinator for Separation Processes. For the first time, I am overseeing all four sections of the course, catering more than 150 students each year. This added responsibility has not only tested my organisational abilities but also allowed me to see the full spectrum of student learning across different cohorts and teaching styles. It has been both challenging and deeply fulfilling.

This paper will narrate my experience throughout the execution of SL from 2019 to 2024 by referring to many previous publication of such (Clandinin & Connelly, 2000; Garrison et al., 2000, Laurillard, 2012), to observe the evolution of a teacher and the students in carrying out Service Learning programs with the students.

Tracing the Pedagogical Shift

Before 2019, my approach to teaching this course was rooted in active and cooperative learning strategies as narrated by works from Salmon (2000), Brookfield (2017) and Knowles et al. (2014). I believed then, as I still do now, that engineering students learn best when they are engaged in doing, discussing, and reflecting. The traditional classroom offered many opportunities for such engagement, but it was largely

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confined to theoretical contexts. The introduction of service learning opened new doors.

From 2019 onwards, students began conducting outreach activities at schools around the Johor area. These weren't just technical demonstrations. They were experiences in communication, planning, teamwork, and public engagement. Students were required to design simple experiments, explain engineering concepts to school children, and most importantly, reflect on what they had learned through the process. In many ways, SL embodied what Kolb (1984) described in his experiential learning theory: learning as a process where knowledge is created through transformation of experience.

UTM students taking Separation Processes (SKTK 3323) were supposed to showcase what chemical engineering is about, as well as important unit operations they have learned in the class, to high school students in order to expose them to what chemical engineering actually is, which is often misinterpreted. They have to use simple language and terms to make the school students understand the contents easily and to inculcate knowledge in simpler manner. They can also arrange for interesting and interactive games at the exhibition booths to attract more visitors and to make it fun.

Physical SL Pre-COVID

So the very first SL program was conducted through a physical program that aimed to blend academic objectives with meaningful community engagement. Recognising the financial demands of executing impactful service projects, I sought external funding and successfully applied for the Project for Happiness (PFH) program, an initiative supported by the Khind Starfish Foundation. My application was accepted, and I was awarded RM3,000, which was to be distributed among four different SL sections. To ensure efficient use of the resources and a unified outcome, the service learning activities were collaboratively designed and implemented through coordinated efforts among the four sections. This included the development of a joint report, documenting the shared goals, execution strategies, and outcomes of our collective SL experience. The students were informed about the task through a Service Learning Memo, which clearly detailed the assignment as shown in Memo (1).

As for my section, we had the opportunity to conduct our Service Learning (SL) activity at Sekolah Tun Fatimah (STF), a premier all-girls boarding school located in Johor Bahru, known for its strong academic performance and leadership development among young women. The visit was both fun and intellectually engaging, providing a vibrant platform for university students to interact with curious and enthusiastic secondary school students.

Our SL module was designed around chemical engineering awareness, and the students set up several interactive booths featuring topics such as distillation columns, chemical process safety, and the role of chemical engineers in daily life. The event took place in an open-air, covered area of the school, which allowed for comfortable engagement despite the large number of participants. The STF students, dressed in coordinated black uniforms with pink embroidery, rotated in groups from one booth to another, actively asking questions and participating in demonstrations.

As the lecturer supervising the session, I observed with pride how my students confidently explained complex engineering concepts using simplified models, posters, and hands-on learning aids. The students' ability to communicate scientific ideas clearly reflected their deep understanding and preparation. The STF students, on the other hand, responded with genuine curiosity and engagement, sparking lively discussions and meaningful interactions.

Some pictures from the SL program are displayed in Figure 1 to 3.

Figure 1. Setup of the SL program

Figure 2. UTM Students explaining to STF students

Memo (1)

SEPARATION PROCESSES (SKTK 3323)
SERVICE LEARNING
TASK MEMO

Starting this year, this course includes a Service Learning (SL) project as an element in your assessment. This element will count for 5% from the overall marks and will be assessed through Peer Assessment. As of this year, the SL task will be detailed below.

THE SERVICE LEARNING (SL) TASK

In order to inculcate knowledge and to give exposure to the society, the proposed activity is for UTM students taking Separation Processes (SKTK 3323) subject to open up exhibition booths which expose and educate students of secondary schools around Johor Bahru about some core unit operations involved in this industry, as well as the Chemical Engineering course itself.

What's Next?

1. Form a working committee in your respective section. The Leader and Assistant Leader for each section are as follows:

Section 01	Leader	Muhammad Haikal Bin Mokhtar
	Assistant Leader	Gaura Chandrika A/P Arumugam
Section 02	Leader	Amirah Arifah Binti Kamil Rafizan
	Assistant Leader	Farra Hannis Binti A Aziz
Section 03	Leader	Ada Wong Chu Wen
	Assistant Leader	Cheng Wai Loon
Section 04	Leader	Alif bin Tami
	Assistant Leader	Shivaneswar A/L Gunasekaran

These students have been listed as student committee in Project for Happiness (PFH) program organised by Khind Starfish Foundation, which we have to report by the end of this year. The foundation has given us some amount of money to fund the project. The name of our project is "Engineers Back To School". The PFH student committee have been given the brief and documents on this project. The Program Director for PFH is Muhammad Ridhwan bin Zayn Al-Abideen from Section 01.

2. Choose a school around Johor Bahru to hold the program.
3. Write a proposal for the SL and submit to your lecturer.
4. Organise the program according to the schedule you attached in the proposal.
5. Make sure everyone gives full commitment. A peer evaluation form will be distributed for assessment at the end of the semester.

The experience highlighted the value of community-based learning, not just for knowledge dissemination but also for nurturing soft skills such as teamwork, communication, and leadership. It was truly rewarding to witness the impact of SL in bridging the gap between higher education and pre-university learning environments, making science more approachable and inspiring for the next generation.

Online SL During Pandemic

From 2020 to 2021, due to the COVID-19 pandemic and movement restrictions, SL had to be adapted into a fully online format. The proposed activity is for UTM students to publish a few videos that will be posted to social medias, mainly YouTube.

Figure 3. UTM Students explaining to STF students

This activity was aimed to expose and educate students of secondary schools mainly, as well as our society, about some core unit operations involved in the industry, as well as the Chemical Engineering course itself. The memo for the online SL is as shown in Memo (2).

Despite the challenges, this shift provided an opportunity to explore creative approaches to community engagement. One of the key initiatives during this period was the production and dissemination of educational videos related to chemical engineering topics, particularly unit operations.

Memo (2)

SEPARATION PROCESSES (SKTK 3323)
SERVICE LEARNING (ONLINE)
TASK MEMO

Since 2019, this course includes a Service Learning (SL) project as an element in your assessment. This element will count for 10% from the overall marks and will be assessed through Peer Assessment. As of this year, the SL task will be detailed below.

THE SERVICE LEARNING (SL) TASK

In order to inculcate knowledge and to give exposure to the society, the proposed activity is for UTM students taking Separation Processes (SKTK 3323) subject to publish a few videos that will be posted to social medias, mainly Youtube. This activity is aimed to expose and educate students of secondary schools mainly, as well as our society about some core unit operations involved in the industry, as well as the Chemical Engineering course itself.

What's Next?

1. Form a working committee in your respective section.
2. Write a proposal for the SL and submit to your lecturer.
3. Organise the program according to the schedule you attached in the proposal.
4. Develop and publish the videos. The mandatory videos to be published are as follows:
    i. Intro to chemical engineering
    ii. Humidification and its application
    iii. Absorption and its application
    iv. Distillation and its application
    v. Liquid liquid extraction and its application
    vi. Solid liquid extraction and its application
    - The video should not be longer than 10 minutes. You are to aim to achieve as many views as possible in Youtube, and you will also be graded based on the number of views.
5. Upload in Youtube and market in Facebook, Instagram, etc.
6. Make sure everyone gives full commitment. A peer evaluation form will be distributed for assessment at the end of the semester.

For instance, videos explaining the principles and real-world applications of distillation, filtration, and heat exchangers were developed and published on digital platforms to reach secondary school students and the broader public. These online materials were well-received and contributed to enhancing science literacy among non-engineering audiences. Students have collaborated well with the group members, and this was reflected in their peer assessment they were asked to fill in. The range of ratings was 4 to 5 in the Likert scale for all assessment components. The number of views achieved above 200 for all videos, although not very high, but satisfactory for beginners. Some screenshots of the videos are as follows (Figure 4 to 6):

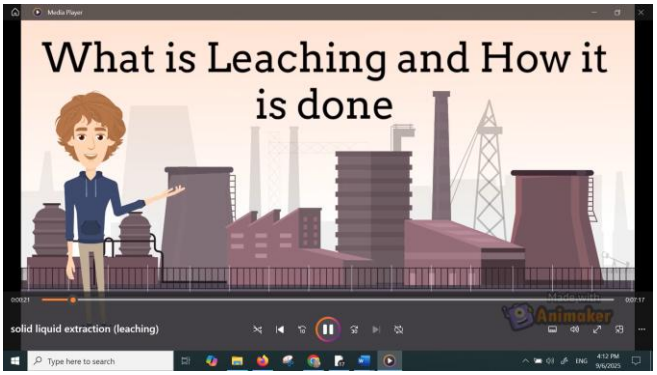

Figure 4. Screenshot of the SL video (Leaching)

Figure 5. Screenshot of the SL video (Humidification)

Figure 6. Screenshot of the SL video (Humidification)

Post-Pandemic (Physical)

In 2022 and 2023, with the easing of restrictions, SL activities resumed in physical mode, restoring a sense of normalcy and reinvigorating student engagement. The return to in-person activities was widely welcomed, as it allowed for more hands-on experiences and meaningful interpersonal interactions with community partners. Students expressed that the physical format felt more enjoyable and impactful, as they could directly observe the outcomes of their service and collaborate more effectively with peers and beneficiaries.

However, for these two years, the SL programs were not coordinated among the sections but held independently. Some pictures taken from the program are attached in Figure 7 to 10 and the memo is shown in Memo (3).

Figure 7. Group picture with the students and teachers

Figure 8. UTM students explaining to school students

Memo (3)

SEPARATION PROCESSES (SETK 3323)
SERVICE LEARNING
TASK MEMO

Service Learning (SL) project is an element in SETK3323 assessment. This element will count for 10% from the overall marks and will be assessed through Peer Assessment. For this year, the SL task will be detailed below.

THE SERVICE LEARNING (SL) TASK

In order to inculcate knowledge and to give exposure to the society, the proposed activity is for UTM students taking Separation Processes (SETK 3323) subject to open up exhibition booths which expose and educate students of secondary schools around Johor Bahru about some core unit operations involved in chemical industry, as well as the Chemical Engineering course itself.

What's Next?

1. Form a working committee in your respective section (Leader, assistant leader, treasury, secretary etc.)
- Each student needs to be involved in at least one committee task
- Form a group for exhibition booths
2. Choose a school around Johor Bahru to hold the program.
3. Write a proposal for the SL and submit to your lecturer in week 3 (through e-learning). Please provide working schedule (SL tentative) in the proposal and start to take action on week 3 of lecture week.
4. Organise the program according to the schedule you attached in the proposal.
5. Please provide a report of the SL task at the end of the program (in week 14).
6. Make sure everyone gives full commitment. A peer evaluation form will be distributed for assessment at the end of the semester.

The return to the physical mode was really a breath of fresh air after being online for almost two years for all activities during the pandemic. The students had expressed their reliefs in their reflections, which really showed their appreciation towards the physical SL activities.

"We never thought teaching kids could be so hard and so fun!" wrote one student in their reflection journal. Another shared, *"It was the first time I saw how much we take our knowledge for granted. Explaining it simply was a whole new skill."*

Return to Online SL

However, in 2024 (and onwards), financial constraints necessitated a return to online implementation. Although students and instructors had by then developed strong digital literacy and adaptability from previous years, the shift was primarily driven by limited funding. Despite the budgetary limitations, efforts were made to maintain the quality and relevance of the SL activities, continuing to deliver value to both students and the community through virtual means. The memo used are similar to the online SL Memo during the pandemic.

Figure 9. UTM students explaining to school teacher

Figure 10. Group of school students in the activity

The links to all the published videos under my sections are as follows.

- Group 1: https://youtu.be/vq9-9WbPUx8?feature=shared
- Group 2: https://www.youtube.com/watch?v=cW891hL9BRA&ab_channel=ANGJINGJOEYA22ET0035
- Group 3: https://youtu.be/vPYUyHubLCY?feature=shared
- Group 4: https://youtu.be/bVmGbdV380s?si=4HTyBh7xRd1WN15L
- Group 5: https://youtu.be/xEcyi4QET6I?feature=shared
- Group 6: https://youtu.be/2rAKnT1bmQc
- Group 7: https://www.youtube.com/watch?v=we1kn8JBU5M
- Group 8: https://youtu.be/56zObdwdHaI

Video from Group 7 has even reached more than 2600 views. Other videos are reaching out to many audiences as well (more than 200 views each).

Although the online SL is a little less impactful in human touch aspects, the gesture was also appreciated, as it can contribute to the perseverance of sustainability. However, to increase communication and interactions with the community, other online activities can be given as the tasks for the students in the future, such as toolkits and models to be distributed to school students and others.

Students can also be encouraged to garner financial contributions and find fundings for their SL activities, if they think physical programs are more impactful. Students can be given the choice to choose between online or physical in the coming semesters.

To provide better understanding, a flowchart of the summary of the SL execution is attached in Fig. 11.

In both physical or online SL, students were expected to form committees, write proposals, organize the programs, develop and publish videos, and market them through digital platforms (for online only). The video topics included key separation processes such as humidification, absorption, distillation, liquid-liquid extraction, and solid-liquid extraction.

The SL component is more effective if delivered physically compared to online. While the shift was initially met with some disappointment, students quickly adapted. The quality of their videos, their ability to connect digitally with audiences, and the level of teamwork they displayed was inspiring.

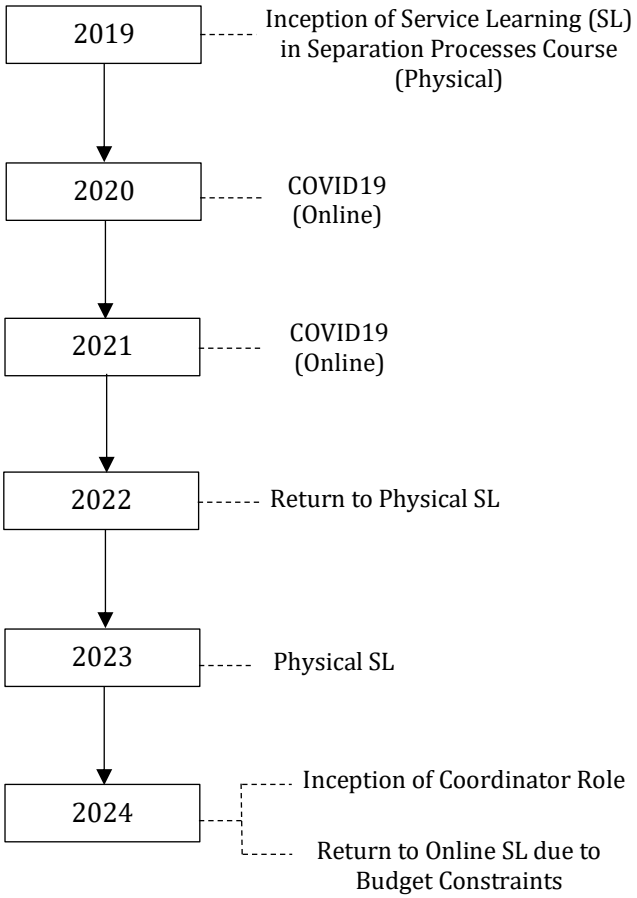

Figure 11. Summary of SL execution

In general, in organising the SL program, students had to form working committees, each member taking at least one role such as leader, assistant leader, treasurer, or secretary. In the physical one, they selected schools or colleges in the Johor Bahru area, developed proposals, scheduled the events, and ran them on-site. Peer assessment was used to evaluate each student's contributions. The exhibitions allowed students to interact with the public, explain complex engineering concepts in simple language, and reflect on their learning journey.

For the online SL, Students created educational YouTube videos, introducing separation principles through animated visuals and real-life analogies. While

the physical interaction was missing, creativity blossomed.

"We had to script, storyboard, and edit like we were running a production team," wrote one student. "I've never worked so hard outside of a lab."

My First Year as Coordinator: A Wider View

Taking up the role of course coordinator in 2025 brought a new layer of responsibility. I was no longer only accountable for my own section, but for harmonising outcomes across all four sections. Coordinating other lecturers - each with their own styles, schedules, and constraints - was daunting at first. It required patience, clarity, and diplomacy.

One of the biggest challenges was ensuring that the SL component was implemented uniformly. I created shared planning documents, held regular briefings, and encouraged lecturers to reflect together on their students' progress. I found strength in collaboration, echoing Vygotsky's (1978) idea of the Zone of Proximal Development - we too, as educators, learn from one another when we work collectively. Even with tight coordination, the SL programs execution can vary between sections. Some students tend to compare negatively, but some can share notes to improve each other.

What's important is to always remember the role of SL in teaching the course and in developing the generic skills of the students. Careful coordination is vital to ensure all elements to be inculcated in the students are well delivered.

Managing the course file and Course Assessment Report (CAR) also fell under my responsibilities. I became more meticulous in documenting learning outcomes, assessment rubrics, and feedback loops. I reviewed trends in student performance, responded to Opportunity for Improvement (OFI) notes from previous cycles, and proposed interventions based on actual student reflections.

Through this process, I learned that curriculum management is not just about compliance, it is about insight. The data, when read with care, tells stories: about where students struggle, where they thrive, and where we as educators must shift our approach.

Learning Through Service

Over the years, it became clear that service learning was not just an add-on to the curriculum. It was a core site of learning, contributing 10% of the total course assessment. Students learned how to plan events, manage time and roles, communicate technical knowledge to non-experts, write proposals and reports, and organise group tasks. They learned to lead, and they learned to follow. Often, I observed the transformation of shy, uncertain students into assertive coordinators who guided their peers with clarity and compassion.

"Before this, I hated group work. But when you're in charge of planning an entire school event, you have no choice but to work together. It changed me," a student wrote.

"This was the first time I had to be a secretary for a real committee. I learned how to write official letters, communicate with school teachers, and manage people."

Such moments were affirmations of what Boyer (1990) called the Scholarship of Teaching and Learning (SoTL) - that teaching, when approached with inquiry and reflection, can be a scholarly and transformative act.

Looking Ahead

As I reflect on my journey with Separation Processes, I am filled with gratitude. I like this course deeply, not only because of its technical richness, but because of the human growth it fosters. Each year, I see my students evolve. They arrive unsure, anxious about equations and exam marks. But they leave more mature, more capable, and more self-aware. This experience can be an example in manifesting the role of SL in enriching our students. A framework of how to implement SL can be suggested to the department and the university as well.

This course has changed me too. It has taught me to see beyond content delivery. It has shown me the value of patience, of listening, and of designing learning experiences that extend into the world.

What do I anticipate for the future? I hope that service learning continues to grow, not just as a requirement, but as a philosophy. I hope my students continue to find joy in serving others while learning. And I hope that I, too, can keep growing alongside them as a teacher, a coordinator, and a learner.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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