Effect of a university extension program on a partner institution's 5s rating and student extensionists' lifelong learning

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A B S T R A C T

The study measures the mutual benefit of a university extension program on a partner institution's 5S ratings and student extensionists' lifelong learning. The extension program involved implementing 5S in a national high school from August 2022 to May 2024. Lifelong learning is an essential skill that enables graduates to adapt faster and more effectively to changes in their work environment. It affects the way people address the diverse challenges they meet daily. On the other hand, extension work allows students to directly apply course theories to problematic situations in a community with identified needs. The activities involved in the extension program enabled the students to solve problems, collaborate, communicate, think critically, and practice creativity while engaging actively with a community outside the university. The student extensionists' involvement in the extension program included delivering short lectures on 5S, facilitating extension activities, designing infographic posters, collecting and analyzing 5S data, and recommending and implementing solutions to improve classroom organization and management. Upon termination of the extension program, the mean 5S score of the partner institution increased from *"minimum acceptable"* at 2.94 to *"very good"* at 3.83. Their knowledge and skill level in 5S increased from *"moderate"* at 3.04 to *"high"* at 4.58. Alongside the successful 5S implementation, the student extensionists' lifelong learning skills in solving problems, collaborating, communicating, critical thinking, and creativity improved *"very much"* at 4.47. Even when the students are still at university, lifelong learning can be enhanced through active participation in a university's extension program. Therefore, the extension program demonstrates the synergistic benefits of community engagement to the partner community and the students. It is recommended that students be actively involved in community extension programs to enhance their classroom learning further and thus demonstrate their lifelong learning.

Suggested Citation (APA Style 7th Edition):

Nerona, G.G., Rabago, N.F.T., Aragon, B.E., Andrada, J.C., Bustos, M.F.B., Ramos, M.L.N., & Kimayong, K.B.S. (2024). Effect of a university extension program on a partner institution's 5s rating and student extensionists' lifelong learning. *International Research Journal of Science, Technology, Education, and Management*, 4(3), 67-81. https://doi.org/10.5281/zenodo.13858921

INTRODUCTION

University community extension programs are steadily gaining recognition for how they can influence positive change in the community through their programs aimed at targeting the community's identified needs. An extension program is a school-organized essential program that aims to contribute to a community's development by rendering services that support peoples' material, physical, capacitating, psychological, and even spiritual needs with the goal of improving their quality of life (Magnaye & Ylagan, 2021). The Philippine Commission on Higher Education's (CHED) memorandum order No. 52 (2016) mandates Higher Education Institutions (HEIs) to incorporate community-based assistance as a solution to the community engagement concern and to serve as a training ground for skill development of servicing individuals (Llenares & Deocaris, 2018). Moreover, through its outcomes-based education, the CHED emphasizes the importance of developing graduates who "*recognize the need for and possess the readiness and capacity to engage in independent and lifelong learning*" (CHED CMO 96 S. 2017). Hence, the CHED recognizes the importance of university extension programs in developing and polishing students' skills while addressing a partner community's identified needs. One method that supports students' learning outside the school boundaries is their involvement in the university's extension programs.

Community extension is one of Saint Louis University's (SLU) core functions, in addition to teaching and research. One recently concluded SLU Industrial Engineering Department extension program involved developing and implementing 5S (*Sorting, Setting, Shining, Standardizing, Sustaining*) at Santo Tomas National High School (STNHS) in Baguio City, Philippines. The extension program aimed to create a clean, safe, orderly, and more conducive learning environment through 5S.

Although HEIs are now implementing extension programs because of the CHED mandate, little literature still exists on measuring their impacts or outcomes (Llenares & Deocaris, 2018). This study, therefore, attempts to offer a methodology for measuring the mutual benefits of an extension program to the partner community and to the university (through its students) as well. The goal of this study is a two-fold one- to determine if an extension program effectively improved the partner institution's 5S rating and to establish if the student extensionists' involvement in the extension program has enhanced their lifelong learning.

Lifelong learning constitutes learning throughout one's whole lifetime. Lifelong learning is necessary for graduates to adapt more quickly to their working environment and utilize their academic training in analyzing, solving, and implementing solutions to problematic situations in the workplace. Lifelong learning also gives graduates a natural desire to learn and adapt to change, thus building more meaningful and fulfilling careers (Laal & Peyman, 2012). The five lifelong learning skills that were commonly identified in studies of lifelong learning included problem-solving, creativity, critical thinking, communication, and collaboration and hence were used to identify lifelong learning skills in this paper (Hameed, 2024; Edo et al., 2022; Laal & Peyman, 2012; Little, 2012).

The educational foundation of this paper lies in progressive learning principles. Progressive education emphasizes students' whole development by encouraging social interaction, critical thinking, collaboration, and communication - with a commitment to the community beyond school (Little, 2015). Progressive education aspires to develop lifelong learners with curiosity, creativity, and a sense of social responsibility who can navigate a constantly changing environment (Hameed, 2024). Moreover, Lev Vygotsky's social development theory states that a student's cognitive development is an enhanced social process through experiences and interactions with others, hence setting the stage for developing other highly advanced thinking skills like thinking critically and solving complex problems (Shabani, 2016). Therefore, progressive education highlights the need for students to do out-of-school activities to experience how theories learned in school can be applied to realistic and practical situations and find a deeper purpose for their learning. Embracing this holistic approach, this study recognizes the symbiotic relationship between classroom learning and learning outside the school's physical boundaries through engagement in the university's extension program.

Several studies have highlighted the importance of 5S in enhancing learners' performance and experiences. A recent extension program in 5S implemented by the same SLU IE department at Happy Hallow National High School revealed how the teachers and learners gained knowledge and skills in their 5S practice, thus improving the school's overall safety, organization, and classroom management (Nerona, 2022). Following the success of this extension program, the SLU-IE department replicated the 5S program in a larger school and increased its scope.

A study by Conte (2020) concluded that a clean, organized, and clutter-free classroom fosters learners' positive attitudes, motivation, participation, and learning readiness. Notably, the study by Jiménez et al. (2015) underscored the effectiveness of each 5S component in contributing to the overall improvement of the learning environment. Moreover, 5S implementation in classrooms improved learners' self-discipline, self-confidence, and self-management (Productivity SA, 2022, as cited by Nerona, 2022). Some studies on implementing 5S in schools showed significant waste reduction, productivity improvement of teachers and learners, reinforced work ethics, enhanced teamwork, motivation, and job satisfaction (Joshi & Shindu, 2018; Wan Asri et al., 2015). This alignment with the established principles and empirical evidence from previous studies reinforces the importance of integrating the 5S system for educational enhancement.

Aside from measuring the impact of the extension program on STNHS's 5S rating, knowledge, and skills in 5S, this study also aimed to determine if the student extensionists from SLU who were active implementers of the extension program benefited by improving their lifelong learning skills-encompassing problem-solving, creativity, critical thinking, communication, and collaboration. This study posits that students' lifelong learning is enhanced while participating in an extension program. Li (2022) revealed in her paper that by 2025, about 5 out of every 10 employees will need to undergo retraining and skill upgrading to enable them to adapt to new trends and technological innovations in their workplace. Her study's findings suggested that lifelong learning should be essential to HEIs' strategic goals to enable its graduates to participate fully in the future workplace. Her study has also highlighted the top 10 skills in high demand by 2025, as identified by the World Economic Forum, which includes analytical thinking and creativity, solving complex problems, critical thinking, and collaborating, among others. These top skills have also been identified as lifelong learning skills needed for employees to stay competent and relevant in their future careers, where "*no one is left behind*" (Li, 2022).

Studies have proven that active community involvement enriches students' lifelong learning through experiences, social interactions, and effectively applying knowledge and skills in real-world scenarios. Students of Saint Louis University, Philippines, who implemented action research in a partner institution to revamp its food storage facility's food storeroom inventory system, have boosted their problem-solving, communication, and collaborative skills "*very much*" (Nerona et al., 2018). A study of the University of the Western Cape, South Africa demonstrated that community engagement has mutually benefited the partner community as well as students' lifelong learning through the transfer and exchange of knowledge (Bidandi et al., 2021). This study also noted that community engagement should be reciprocal, with clearly identified benefits for both the community and the university. A study that focused on engaging students by collaboratively working through real-world projects found that collaborative community-based projects positively affected students' critical thinking, lifelong learning, collaboration, and openness to change (Mebert et al., 2019). Lifelong learning skills are also essential for students to have a sense of fulfillment when it comes to contributing to the betterment of the community by utilizing their knowledge and expertise (*ABET*, 2018).

Community extensions and engagements are considered the "field practice" that serves as a training ground and opportunity to involve themselves in community welfare activities that may actualize and enrich their learnings at school (Aga, 2018). In addition, students who participate in extension programs develop a high sense of community and involvement (Lao, 2009), thus fostering a lifestyle of professional development and social responsibility. Through extension programs offered by educational institutions, such as Saint Louis University, students can access opportunities for continuous learning and skill development, empowering them to fulfill their roles more effectively and make meaningful contributions to society.

OBJECTIVES OF THE STUDY

The objective of the study is to establish the mutual benefit of engaging in an extension program, both to the partner community (beneficiary) and to the student extensionists. Throughout this study, only a few published articles were found measuring the reciprocity of extension programs on the beneficiary community and the university as well. Although community engagement is generally perceived as a school's social responsibility, the attempts of universities to explain the impact of these engagements appear complex due to the lack of homogeneous measurement tools since the dynamics of community engagement seem to differ for each institution (Bidandi et al., 2021). Hence, this paper attempts to contribute to this knowledge gap by demonstrating a methodology for analyzing and measuring extension program outcomes for both the community and university student extensionists. The study's objectives are outlined as follows:

1. To measure the partner institutions' improvement in their 5S ratings after the extension program implementation.
2. To measure the partner institutions' improvement in their knowledge and skill levels after the extension program implementation.
3. To measure the student extensionists' enhancement of their lifelong learning skills after active involvement in the extension program.

The following questions were formed to guide the study in addressing the study's objectives.
1. How did the partner institution's 5S rating improve after implementing the extension program?
2. How did the knowledge and skills level of the partner institution on 5S practice improve after implementing the extension program?
3. How were the student extensionists' lifelong learning skills enhanced after implementing the extension program?

MATERIALS AND METHODS

The case study methodology was utilized for this study, employing both quantitative and qualitative techniques in analyzing data. The case study method permits a more detailed and in-depth analysis of the effect of conducting the extension program to both the partner institution and the student extensionists. It is a widely accepted methodology for evaluating educational outcomes as well as community-based projects (Zainal, 2007). The descriptive-comparative method was also used to compare the mean 5S scores of the STNHS before and after the implementation of the 5S extension program and to assess the enhancement of the student extensionists' lifelong learning after their active participation in the extension program.

The selection of the extension program's partner institution (Santo Tomas National High School or STNHS) was based on its qualification as a partner community as stipulated in the SLU Community Extension and Outreach Manual of Procedures and Guidelines (2023), aligning with the SLU CICM Advocacy on Peace and Justice and Indigenous Peoples. Due to logistical constraints, the extension program was implemented in six pilot classrooms from Grades 7 to 12, from August 2022 through May 2024. For specific problems 1 and 2, the study included 39 respondents, comprising the 5S team of each class (5-6 students and one teacher per class) at the STNHS. For problem number 3, the respondents included 34 SLU Industrial Engineering student extensionists who actively participated in the extension program for at least one semester.

To answer the research problem, the following activities were accomplished:
1. A pre-test and needs analysis was done to establish a baseline and determine the need to conduct the extension program.
2. Following the needs analysis results, the extension program was implemented through the 5S process steps shown in Table 1.

3. After the extension program, direct assessments and qualitative post-tests were done to measure the improvement in the partner institution's 5S rating, as well as knowledge and skill levels on 5S. A qualitative assessment was also done to measure the student extensionists' enhancement of their lifelong learning after the extension program.

Data Gathering Instruments

Three self-assessment questionnaires and one audit sheet were utilized to measure the extension program's effectiveness in improving the partners' identified knowledge and skills in 5S and in student extensionists' lifelong learning. Self-assessments are considered reliable indicators of qualitative gains in knowledge, design skills, problem-solving, communication, collaborative learning, and other skills since the respondents report results based on their own learning experiences and interactions (Cole et al., 2011; Nerona et al., 2018; Terenzini et al., 2001). Also, qualitative self-assessments have a high internal consistency rating, and are shown to be reliable across several skills and tasks (Ross, 2019). The full questionnaire items are available with the main author.

Questionnaire 1: Direct Assessment- 5S checklist

The 5S checklist was referenced from the study by Nerona (2022), which conducted a 5S implementation at another high school in Baguio City. Thirty-nine respondents, composed of 5S teams (1 teacher and 5-6 students per class) from the 6 pilot classrooms from STNHS, evaluated their level of implementation for each of the 5S's before and after the extension program. This checklist had 29 items that measured 5S implementation in the 6 pilot classrooms and had a Cronbach Alpha reliability of 0.88 and a Content Validity Index (CVI) of 1.0.

5S Audit Sheet- Direct Assessment

Aside from Questionnaire 1, a 5S audit checklist comprising 13 items for general 5S applications was used by an audit team from the SLU IE department faculty and student extensionists to evaluate and validate the 5S implementation in each pilot classroom. This was done to validate the results of questionnaires 1 and 2.

Questionnaire 2: Qualitative Assessment

The extension program assessment form FM-CEO-013 (2022) was used to evaluate the partner institution's knowledge and skills in 5S practice pre- and post-implementation, with a Cronbach reliability coefficient of $\alpha = 0.86$. Questionnaires 1 and 2 were referenced from the previous extension program of the SLU IE department, which also involved 5S implementation in a public high school (Nerona, 2022).

Questionnaire 3: Qualitative Assessment- Student Extensionists' Lifelong Learning

A customized self-assessment questionnaire that covers 49 items was used to measure the SLU student extensionists' lifelong learning skills in creativity, problem-solving, collaboration, critical thinking, and communication. Cronbach's alpha reliability coefficient of $\alpha = 0.98$ was attained for this questionnaire. The items in the questionnaire were referenced from studies by Trerenzini (2001) and Nerona (2018), which encompassed a thorough assessment of lifelong learning skills that the study aimed to determine their enhancement after the extension program.

Data Gathering Procedure

Before commencing the extension program, questionnaire number 1 served as a pre-test to 39 respondents of the partner institution regarding their knowledge and practice of 5S- Sorting, Setting, Shining, Standardizing, Sustaining (Oktafiani et al., 2022) in their classrooms to establish baseline information for the study. The extension program was implemented from August 2022 through May 2024, covering four projects across all the levels of 5S.

Through the guidance of the SLU IE extension program coordinator, the student extensionists' involvement in the extension program included participation in planning, delivering short lectures on 5S, facilitating extension activities, doing classroom audits, identifying issues on 5S, brainstorming and simulating solutions, making written and oral reports, designing infographic posters, collecting and analyzing 5S data, and recommending, as well as implementing solutions to improve classroom organization and management. After the program's implementation, a post-test was done to the same 39 respondents, through administering questionnaires 1 and 2, for the quantitative and qualitative assessments of the extension program. To validate the results of Questionnaire 1, six SLU 5S audit teams composed of one faculty and 4-5 industrial engineering students each performed a 5S audit for the six pilot classrooms after the extension program's implementation. The audit results were entered in the 5S audit check sheet. Aside from these, questionnaire number 3 was administered to 34 SLU IE Department student extensionists, to determine if their lifelong learning skills were enhanced after actively participating in the extension program. In this study, student extensionists refer to SLU Industrial Engineering students who participated in the extension program for at least one semester.

Table 1 summarizes the tasks, objectives, activities, and outcomes of the extension program across 5S phases, covering the timeline from August 2022 to May 2024. Referencing of these process tasks came from the industrial engineering department's previous extension program at the Happy Hollow National High School (Nerona, 2022) and on the updated framework of the SLU Community Extension and Outreach Manual of Procedures and Guidelines (2023).

Table 1. Summary of 5S Process Tasks

Objectives	Inputs	Activities	Outputs	Outcomes
Project 1 August 2022- December 2022 • Needs assessment of the program (Pretest)	• Checklist • Seminar kit • Faculty and student extensionists' participation • Program Funding	• Administer checklist • Seminar-Workshop • Extension Visitation • Analysis and reporting of results	Needs Assessment Report (written and oral)	Proof indicating the necessity for formulating and executing a 5S program.
Project 2: January 2023- May 2023 Accomplishment of 1st S and 2nd S- Sorting and Setting activities	• Job aids • Faculty and student extensionists' participation • Program Funding	• Printing of materials • Seminar • Project 2 evaluation	Accomplished Sort and Set-in-order checklist, analysis and reporting of the results	A more orderly, balanced use of available space, fewer hazards, and a cleaner environment.
Project 3: August 2023- December 2023 Accomplishment of 3rd S and 4th S- Shining and Standardizing	• Job aids • Seminar kit • Faculty and student extensionists' participation • Program Funding	• Printing of materials • Extension Visitation • Seminar • Canvassing, purchasing, and turnover of requested materials • Project 3 evaluation	Accomplished Shine checklist, analysis and reporting of the results	A classroom setting that is structured, ergonomic, devoid of clutter, and facilitates easy navigation.

Project 4: January 2024- May 2024 The accomplishment of Sustaining (5S) and conducting an impact assessment of the program (Post-test)	• Job aid • Seminar kit • Faculty and student extensionists' participation • Program Funding	• Printing of materials • Extension Visitation • Seminar • Post Test Assessment • Impact Assessment	• Accomplished 5S checklist and impact assessment • Reporting of results and sharing of experiences of participants • Extension Program Report	A revised set of guidelines establishes a new model for utilizing classroom space and its resources, leading to enhanced classroom management and safety. Increased involvement and dedication from teachers and students in maintaining 5S practices at STNHS.

Table 2 presents the qualitative interpretation of mean scores for the 5S checklist and the 5S audit form. The interpretations were derived from the previous 5S program of the SLU-IE department (Nerona, 2022).

Table 2. Interpretation Scale for 5S Checklist Mean Scores

Mean Score	Interpretation	Description
4.20-5.00	Excellent (E)	Daily routines incorporate the best practices for arranging and organizing the workspace and other belongings. There is constant evidence of excellent housekeeping.
3.40-4.19	Very Good (VG)	Evidence shows that supplies and other objects are being organized and arranged. The housekeeping procedures are well thought out and executed.
2.60-3.39	Minimum Acceptable (MA)	There are established work practices that are typically in place. Policies for housekeeping are created and often followed.
1.88-2.59	Marginal (M)	The necessary standards are not documented, and work practices are not usually followed. There are inspections, but no progress is tracked.
1.00-1.79	Unacceptable (U)	A few standards/procedures exist, but not everyone is informed. Minimal attention is given to housekeeping and safety. No inspections are conducted.

Table 3 shows the interpretation of the qualitative program evaluation taken from the SLU-controlled form FM-CEO-013 (Nerona, 2022).

Table 3. Qualitative Interpretation of Mean Scores for Knowledge and Skill Levels

Mean Score	Qualitative Interpretation
3.63-5.00	High knowledge and Skill level
2.33-3.62	Moderate Knowledge and Skill Level
1.00-2.32	Low Knowledge and Skill Level

Table 4 shows the qualitative interpretation of the student extensionists' lifelong learning assessment.

Table 4. Qualitative Interpretation Guide for Lifelong Learning Skills Enhancement

Mean Score	Qualitative interpretation	Description

4.20-5.00	Very Much (VM)	Extensionists perceive a significant enhancement in their lifelong learning skills, believing that the activity has a transformative effect, leading to substantial skill growth and development.
3.40-4.19	Substantial (S)	There is a significant enhancement in their lifelong learning skills, experiencing noticeable improvement, and I strongly agree that the Extension has substantially impacted their lifelong learning skill development.
2.60-3.39	Moderate (M)	Extensionists deem a moderate enhancement in their lifelong learning skills, noticing a tangible improvement, but not substantial enough to be considered a major transformation in their abilities.
1.80-2.59	Little (L)	Implies that only a slight enhancement in the extensionists' lifelong learning skills. Minimal enhancement has been observed and may not significantly impact their overall skill development.
1.00-1.79	None (N)	There has been no noticeable enhancement in lifelong learning skills as a result of the intervention or activity. Extensionists perceive no impact on their lifelong learning skills after the Extension Program.

Treatment of data

The research utilized the weighted mean and paired t-tests to statistically determine significant improvements in the partner community's 5S ratings, knowledge, and skills. The t-test is a robust statistical measure applied to "before" and "after" measurements, where the treatment group also serves as its own control (Najmi et al., 2021). Statistical calculations were done through the Jamovi-R Analytical Software (2022). The formula for the paired t-test used in this study is

$$t = \frac{\bar{d} - 0}{s_d / \sqrt{n}} \qquad \text{(Milton \& Arnold, 2004)}$$

Where: t = t-statistic

$\bar{d}$ = mean of the difference between the pre-test and post-test scores

s_d = standard deviation of the difference between the pre-test and post-test scores

n = sample size

Ethical Considerations

Before commencing the extension program, a Manifestation of Consent and Cooperation was signed by the mutual parties (the partner institution- STNHS, and Saint Louis University) as their agreement to engage in the extension program from August 2022 until its termination.

RESULTS AND DISCUSSION

Improvement of the 5S rating of the partner institution after implementing the extension program

The post-test results were compared to the pretest results for the 5S checklist (questionnaire number 1). The 5S checklist was administered to 39 respondents (35 students and 4 teachers) of the STNHS in September 2022, who formed the 5S team of the 6 pilot classrooms. After implementing the extension program, the same 39 respondents again answered the post-test questionnaire on April 2024, to determine if their level of 5S practice improved after the extension program. Table 5 summarizes the results. The summarized results of the 5S checklist with 29 items (Sorting- Items 1-8, Setting- Items 9-13, Shining- Items 14-22, Standardizing- Items 23-26, Sustaining- Items 27-29) are as follows:

Table 5. 5S Classroom Application Mean Scores of Partner Institution Before and After Extension Program

5S Category	Pretest (Before Program)	Post-test (After Program)	Gain Score	p-value (Paired t-test)	Interpretation

1S- Sorting	3.00 (MA)	3.80 (VG)	0.80	<0.001	Significant
2S- Setting-in-order	2.80 (MA)	3.97 (VG)	1.17	0.001	Significant
3S- Shining	3.08 (MA)	3.78 (VG)	0.70	<0.001	Significant
4S- Standardizing	2.77 (MA)	3.76 (VG)	0.99	0.023	Significant
5S- Sustaining	3.06 (MA)	3.82 (VG)	0.76	0.011	Significant
Overall	2.94 (MA)	3.83 (VG)	0.89	<0.001	Significant

Direct assessment of the program's effectiveness in improving the 5S practice of STNHS was measured through this checklist. Table 5 shows that 5S practices in the classrooms of STNHS improved significantly. From 2.94 before the extension program (*minimum acceptable* level), the 5S practice of STNHS jumped to 3.83 after the program (*very good* level*)*. The greatest gain score was obtained in the 2S or Setting-in-order activities. This result agrees with the mean rating of 3.95 (very good) given by the 5S audit team composed of SLU Industrial Engineering faculty and their IE student teams. A "Very Good" rating means the pilot classrooms are well-organized and have little clutter. For the most part, books and school supplies are organized and placed in easily accessible locations. Labels and appropriate supply storage are being used in the classrooms. Furthermore, daily cleaning is done on the floors, trash cans, and whiteboards/blackboards. In addition, the SLU-IE extension team designed infographics and checklists for each pilot classroom to ensure the program's sustainability even after termination. These infographics and checklists are the basis for the standard 5S practices to be employed in each classroom to maintain the overall organization, cleanliness, and safety of the classrooms. The teachers and project leaders received an electronic file of the 5S Sustain documents. Teachers and students are now conscious of practicing the 5S in their classrooms.

Improvements in 5S practice:

Before the extension program, some items were present in the rooms that were not needed, like old papers, water containers, broken chairs and tables, and clutter/garbage above the blackboards and window seals. There was no designated place for sorting materials. Cleaning materials were present but not stored properly. There was no proper labeling and storage of supplies. The rooms had broken window glasses, blackboards, chairs, tables, and doors. Blackboards, windows, surfaces, and floors were dusty.

After the extension program, acceptable classroom furniture and documents were defined and followed, and specific cleaning and organizing tasks were assigned. Little to no clutter was found in the classrooms. There was a designated place to store items in the classroom, and labeling was used whenever appropriate. The desks and chairs are arranged properly. The blackboards, floors, walls, surfaces, and windows are clean and dust-free. The broken windows, chairs, blackboards, and doors were repaired. 5S practices are now part of their daily routine, and checklists and infographics are used to determine if the work is complete.

The extension program results align with the outcomes of other 5S studies done in the educational setting. The study by Nerona (2022) revealed a successful implementation of 5S through a university extension program that improved the partner institution's overall organization, classroom management, and safety. Another study concluded that implementing the 5S methodology in educational institutions is a transformative strategy for creating a clean, organized, conducive, safe learning environment and promoting mental enrichment (Mirza, 2023; Mulyani et al., 2023; Abu Bakar et al., 2019). By fostering a culture deeply rooted in the principles of 5S, schools can create an environment conducive to effective teaching and learning.

A visual comparison of "before" and "after" photos of one pilot classroom is shown in Figure 1.

One pilot classroom "before" the extension program	The same pilot classroom "after" the extension program
Issues: broken window glasses, missing door knobs and door hinges, some broken chairs, clutters, unorganized classroom furniture, dusty chairs, boards, walls, and floors, and books randomly stored on shelves and floor spaces.	Solved issues: replaced broken window glasses, hinges, and door knobs; organized classroom furniture; repaired broken furniture; standardized cleaning practices; proper storage of materials was identified and labeled.

Figure 1. "Before" and "After" comparison of a pilot classroom

Improvement of knowledge and skill level of the partner institution after implementing the extension program

The Extension Program Assessment Form FM-CEO-013, created by the SLU Community Extension and Outreach Programs Office (2022), gauged the knowledge and skills of the STNHS. Table 6 shows the result of the assessment form.

Table 6. Summary of Partner Institution's Knowledge Level Before and After the Extension Program

Topics in 5S	Before the program	After the program	Gain Score	p-value (paired t-test)	Interpretation
Topic #1 – 1S (Sorting)	3.23 (M)	4.56 (H)	1.33	<0.001	Significant
Topic #2- 2S (Setting-in-order)	3.08 (M)	4.64 (H)	1.56	<0.001	Significant
Topic #3- 3S (Shining)	2.97 (M)	4.59 (H)	1.62	<0.001	Significant
Topic #4- 4S (Standardizing)	3.08 (M)	4.62 (H)	1.54	<0.001	Significant
Topic #5- 5S (Sustaining)	2.87 (M)	4.51 (H)	1.64	<0.001	Significant
Overall	**3.04 (M)**	**4.58 (H)**	**1.54**	**<0.001**	**Significant**

The increase in the mean scores from 3.04 to 4.58 demonstrates that the STNHS learners' and teachers' understanding of 5S improved significantly, progressing from *moderate* before the program to *high* afterward. The highest gain scores of the respondents are from the Sustaining and Shining topics, where knowledge gains of 1.64 and 1.62 points were observed. Based on the partners' perception, their knowledge level has increased greatly because of the multiple engagements and trainings they had with the SLU extension team. This indicates the program's success

in cultivating the knowledge of both teachers and students of STNHS regarding the fundamentals, practices, and execution of 5S.

Table 7 presents the comparative skill levels of teachers and students in 5S before and after participating in the extension program.

Table 7. Summary of Partner Institution's Skill Level Before and After the Program

Topics in 5S	Before the program	After the program	Gain Score	p-value (paired t-test)	Interpretation
Skill #1: Applying 5S in my own space	2.87 (M)	4.41 (H)	1.54	<0.001	Significant
Skill #2: Communicating issues/problems that arise in relation to 5s	2.87 (M)	4.41 (H)	1.54	<0.001	Significant
Skill #3: Teamwork in accomplishing 5s activities	3.21 (M)	4.54 (H)	1.33	<0.001	Significant
Overall	2.98 (M)	4.45 (H)	1.47	<0.001	Significant

Through the extension program implemented, a significant improvement in the STNHS students' and teachers' proficiency in applying 5S practices was demonstrated, transitioning from moderate to high post-program. The highest gain scores came from practicing 5S in their work area and communicating issues on 5S. The teachers' comments written on the questionnaire included "being able to apply 5S in my own workspace in the faculty room as well" and "applying sorting and periodic cleaning in my office area." Again, this perceived increase in skill level is attributed to a gradual improvement in the 5S application throughout two years of engagements and training. This success underscores the program's effectiveness in enhancing skills and fostering natural 5S implementation.

Enhancement of student extensionists' lifelong learning skills after participating in the extension program

Table 8 presents the mean scores of the progress each student extensionist has made in a variety of areas under lifelong learning due to their active participation in the extension program. The items were categorized into five areas, including Problem-Solving (questions 1-9), Creativity (questions 10-18), Critical Thinking (questions 19-27), Communication (questions 28-36), and Collaboration (questions 37-45).

Table 8. Mean Ratings of Extensionists' Progress in their Lifelong Learning Skills Before and After the Program

Lifelong Learning Skill	Mean Rating	Interpretation
Problem-Solving	4.45	Very Much
Creativity	4.46	Very Much
Critical thinking	4.38	Very Much
Communication	4.46	Very Much
Collaboration	4.59	Very Much
Overall	4.47	Very Much

The student extensionists believe they have enhanced their lifelong learning skills "very much" due to participating actively in the extension program. The students gave the highest rating to collaboration, followed by creativity and communication. These ratings resulted from the different activities the student extensionists engaged in during the extension program.

Problem-Solving

The extension program significantly enhanced problem-solving skills among participants by "very much". Their ability to identify necessary information, analyze problems effectively, and divide issues into manageable components showed notable improvement. During ocular inspections, they identified classroom issues and proposed solutions using industrial engineering methodologies like 5S, quality tools, and project management. Strengthening this skill can empower them to tackle complex challenges in various aspects of life by applying acquired knowledge and skills effectively.

Creativity

Extensionists enhanced their creativity by "very much," particularly in generating fresh ideas through brainstorming, exploring new approaches to problems, tailor-fitting the solutions to each classroom, and selecting the best solutions. They applied creativity during brainstorming sessions to address issues related to implementing 5S in classrooms, presenting feasible solutions within resource constraints. Cultivating creativity fosters resilience and innovation, which are essential for navigating a dynamic world and tackling real-life problems effectively.

Critical Thinking

Critical thinking skills improved by "very much" among participants, evident in their ability to express and defend opinions logically and analyze problems thoroughly. They validated observations and recommendations with factual evidence, enhancing decision-making based on reliable information. Strengthening critical thinking equips individuals to make informed decisions and evaluate information effectively, which is crucial for navigating complex situations.

Communication

Communication skills were enhanced by "very much", particularly in using visual aids, engaging in conversations, and conveying ideas effectively both in writing and orally. Participants communicated findings and recommendations effectively during interactions with students and teachers and in formal presentations. These improved their communication skills in expressing ideas and viewpoints in diverse settings, preparing participants for future endeavors.

Collaboration

Participants demonstrated improved collaboration skills by "very much", including listening to others' ideas, respecting diverse perspectives, and engaging team members in problem-solving. Despite differences in year levels, participants effectively collaborated in conducting surveys and generating recommendations as a team. Strengthening collaboration skills prepares individuals to work effectively in diverse teams, contributing to achieving common goals amidst diversity.

The findings of this study are parallel with other studies that have established the gains of students in their critical thinking, problem-solving, practical learning, and other lifelong learning skills through active involvement in community engagement programs. These related studies have also established the mutual benefit of community engagement programs to both the beneficiary community and to the students who actively participated (Zhang, 2024; Bidandi et al., 2021; Salazar, 2020; Medina, 2019; Laal & Peyman, 2012; Herrera, 2010).

CONCLUSION AND RECOMMENDATION

Results from the 5S post-assessment showed a significant improvement in the school's 5S practices after program implementation, from *minimum acceptable* in the pretest to *very good* in the post-test. Comparative assessments of the partner institution's knowledge and skill levels before and after the program revealed significant improvements, progressing from *moderate* to *high*.

For the student extensionists, results indicated significant enhancements across all dimensions of lifelong learning skills, with mean ratings consistently falling within the "*very much*" range. Extensionists significantly improved problem-solving, creativity, critical thinking, communication, and collaboration skills. These findings underscore the effectiveness of extension programs in enriching lifelong learning skills, which are crucial for meeting the evolving demands of the workforce and fostering community development.

It is recommended that the 5S program be deployed to the rest of the classrooms of STNHS, including the learning resource centers, faculty rooms, and other offices. It is also recommended that a 5S audit be done twice a year (once every semester) to monitor the school's 5S practice. These audits demonstrate the university's commitment to quality education and sustainability.

Students are encouraged to participate actively in the university's community extension programs to enhance their lifelong learning. Future studies may explore other aspects of impact assessments of extension programs, such as assessing their effect on other student outcomes in the outcomes-based education framework.

ACKNOWLEDGMENT

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